

Project:

ENORASIS

(Grant Agreement282949)

"ENVIRONMENTAL OPTIMIZATION OF IRRIGATION MANAGEMENT WITH THE COMBINED USE AND
INTEGRATION OF HIGH PRECISION SATELLITE DATA, ADVANCED MODELING, PROCESS CONTROL AND
BUSINESS INNOVATION"

Funding Scheme: Collaborative Project

Theme: FP7-ENV

ENORASIS User Manual

Table of Contents

1. WEB APPLICATION	1
1.1 Registration	1
1.2 Login screen	2
1.3 Successful login	2
1.4 Generic UI and functionalities	4
1.5 Crop types management (admin)	8
1.6 Soil types management (admin)	9
1.7 Sensor types management (admin)	10
1.8 Users management (admin)	11
1.9 Insert/Update Field	12
1.10 Field view	14
1.11 Insert/Update Plot	16
1.12 Plot View	19
1.13 Insert/Update Valves	21
1.14 Valve view	22
1.15 Insert/Update Sensors	23
1.16 Sensor view	24
1.17 Manually insert data for sensor	25
1.18 Manually insert data for valve	26
1.19 Assign rights to Users	27

List of figures

Figure 1 – Home screen.....	1
Figure 2 – Registration form.....	1
Figure 3 – User Type options.....	2
Figure 4 – Confirmation message of successful registration.....	2
Figure 5 – Login form	2
Figure 6 - Login error	2
Figure 7 – Home screen of successful login – regular User	3
Figure 8 - Home screen of successful login - admin User.....	3
Figure 9 - My Account	4
Figure 10 - Overview.....	4
Figure 11 - Read SOS Sensors.....	5
Figure 12 - DSS Execution - Valves actions	5
Figure 13 - Universal Connector.....	6
Figure 14 - Rest API.....	6
Figure 15 - DSS Calculation	7
Figure 16 – Map	7
Figure 17 - Map options.....	7
Figure 18 - Map zooming	8
Figure 19 - Crop types management	8
Figure 20 – Create Crop type	8
Figure 21 – Delete Crop type.....	9
Figure 22 – Soil types management	9
Figure 23 – Create Soli type.....	10
Figure 24 – Delete Soil type	10
Figure 25 - Sensor types management	10
Figure 26 – Create Sensor type	11
Figure 27 – Delete Sensor type	11
Figure 28 – User management	12
Figure 29 – Delete confirmation.....	12
Figure 30 – My Fields	12
Figure 31 – Create Field	13
Figure 32 – Drawing the field	13
Figure 33 – Drawing finished.....	14
Figure 34 – My Fields	14
Figure 35 – Field view	15
Figure 36 – Related Plots	16
Figure 37 – Create plot.....	17
Figure 38 – Updated Related Plots	17
Figure 39 - Delete Plot	18
Figure 40 – Plot View	19
Figure 41 - View DSS Details.....	20
Figure 42 - Previous DSS Results.....	20
Figure 43 - DSS Inputs.....	21
Figure 44 - WRF DSS Inputs	21
Figure 45 – Related Valves.....	21
Figure 46 – Create Valve	22
Figure 47 – Updated Related Valves	22
Figure 48 - Related Valves	22
Figure 49 - Valve view.....	23
Figure 50 – Related Sensors.....	23
Figure 51 – Create Sensor	23
Figure 52 – Updated Related Sensors	23
Figure 53 – Related Sensors.....	24

Figure 54 – Sensor data	25
Figure 55 – Related Sensors.....	26
Figure 56 - Add sensor measurements	26
Figure 57 – Related Valves.....	27
Figure 58 – Add water irrigation amount.....	27
Figure 59 - Field Permissions.....	27
Figure 60 – Updated Field Permissions	28

List of tables

No table of figures entries found.

1. WEB APPLICATION

The ENORASIS web application can be accessed through the URL <http://app.enorasis.eu/> using any web browser.

Home screen is shown in Figure 1. ENORASIS project is described in a few sentences and the Users have two options, to login in order to access the web application or to register and get a new account.

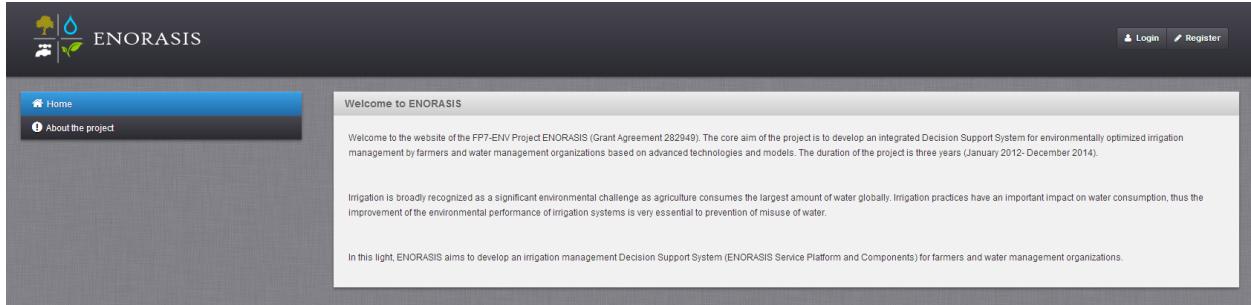


Figure 1 – Home screen

The *About the Project* menu button will lead you to the ENORASIS Project web site.

1.1 Registration

Registration form is shown Figure 2. In order to register, the User need to fill all required fields:

- Name
- E-mail
- Password
- Retype password
- Phone
- User type

If any filed remain empty, *Save changes* button will not take action.

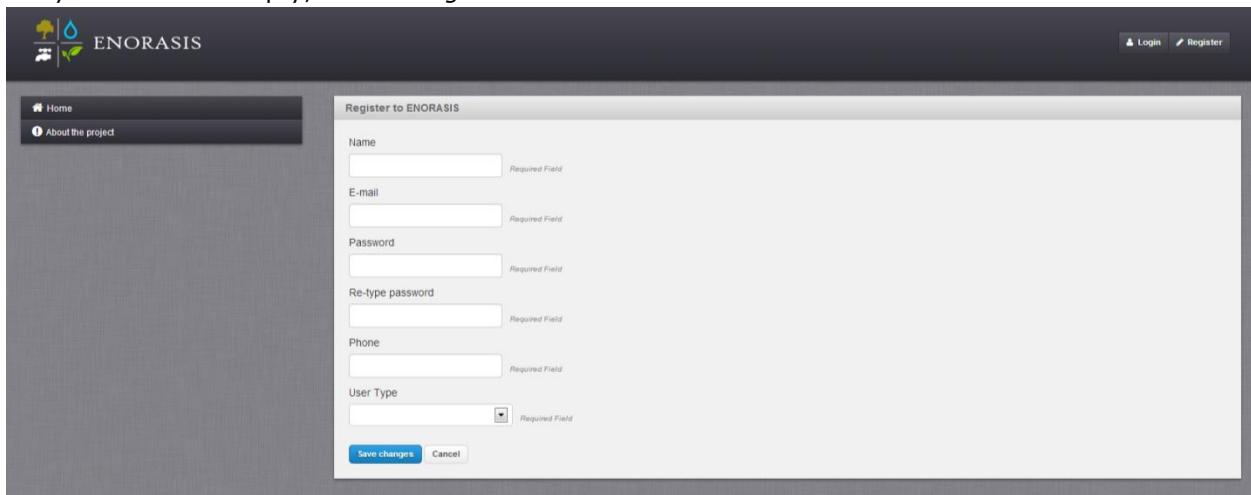


Figure 2 – Registration form

The User can select one of the predefined options for *User Type* – shown on Figure 3.

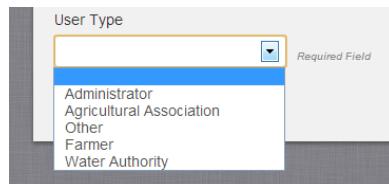


Figure 3 – User Type options

After successful registration - Figure 4, the User can log in to ENORASIS system.

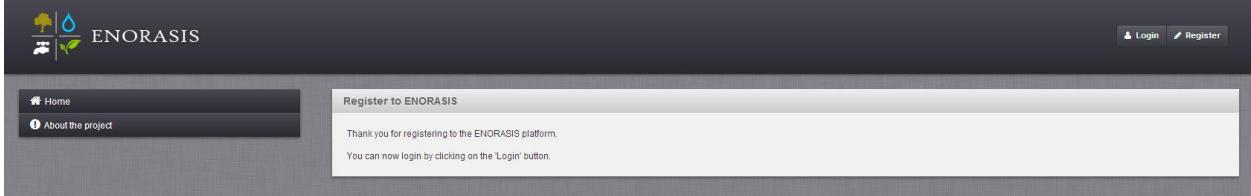


Figure 4 – Confirmation message of successful registration

1.2 Login screen

In order to access ENORASIS system the User need to provide correct email and password. If the User has forgotten his/her valid password, he/she can reset password by clicking on *Reset password* button. New password will be sent on the User email.

Figure 5 – Login form

If credentials are wrong, ENORASIS system will generate Error shown in Figure 6.

Figure 6 - Login error

The User may choose to create a new account by clicking on *Create new account* button. New account procedure is already described in chapter 1.1. The User may also reset password in case that he/she has forgotten it. A new password will be send on e-mail by pressing the *Reset password* button.

1.3 Successful login

After successful login to the system the screen appears as shown in Figure 7 in case that you are a regular User or Figure 8 if you are an administrator.

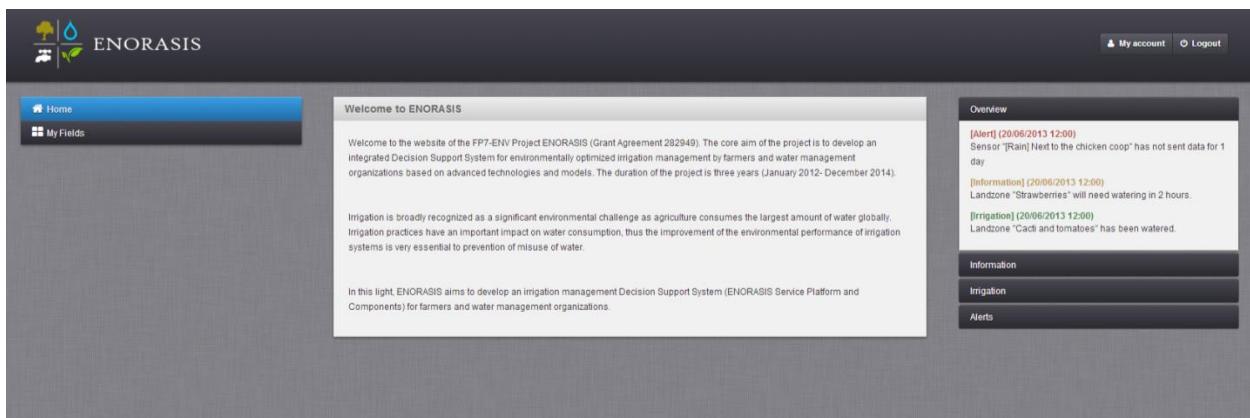


Figure 7 – Home screen of successful login – regular User

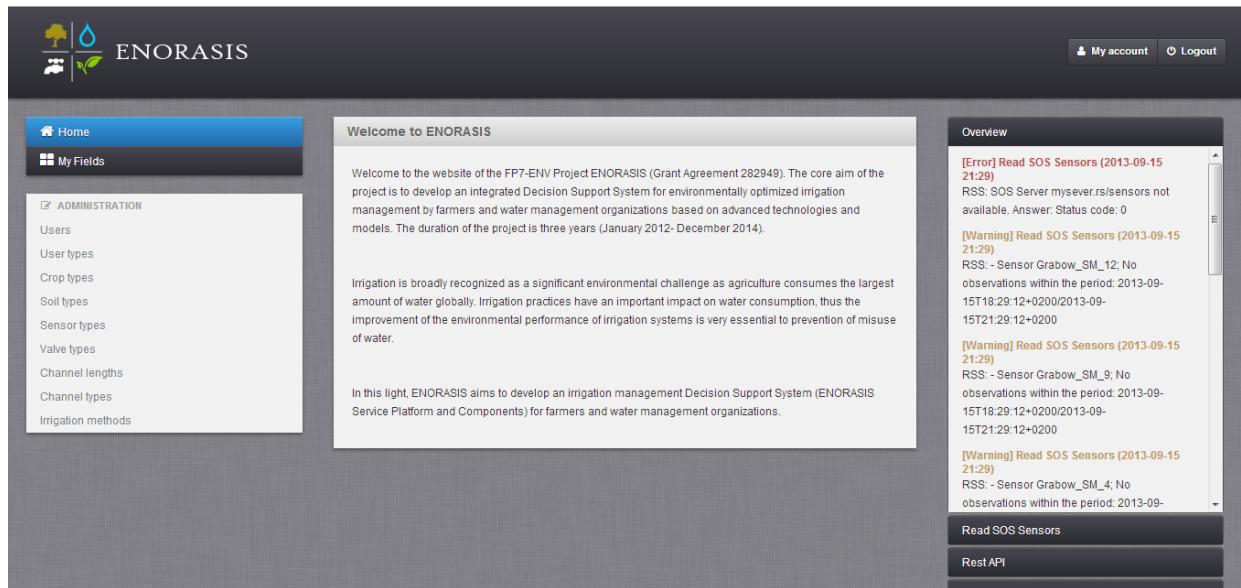


Figure 8 – Home screen of successful login - admin User

By clicking on the *My account* button in the top right corner, the User has the ability to change his/her profile data - Figure 9

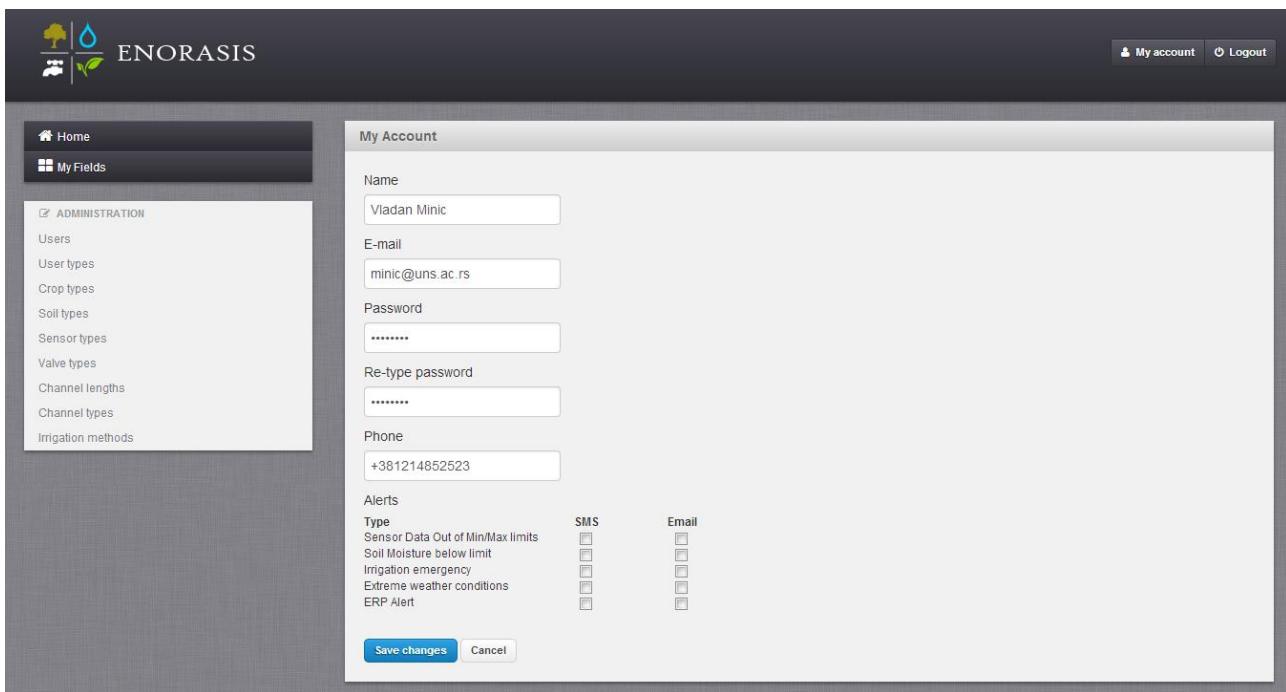


Figure 9 - My Account

1.4 Generic UI and functionalities

After successful login the accordion right menu will appear showing brief information for the following options:

- Overview - Figure 10
- Read SOS sensors - Figure 11
- DSS executions - Valves actions - Figure 12
- Universal connector - Figure 13
- Rest API - Figure 14
- DSS Calculations - Figure 15

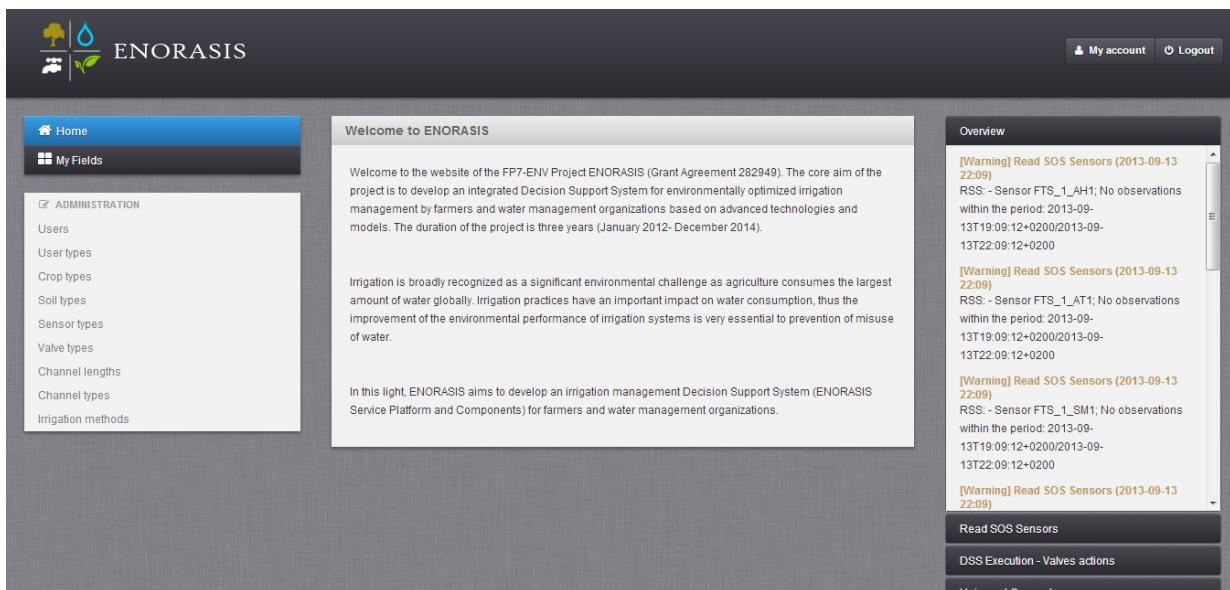


Figure 10 - Overview

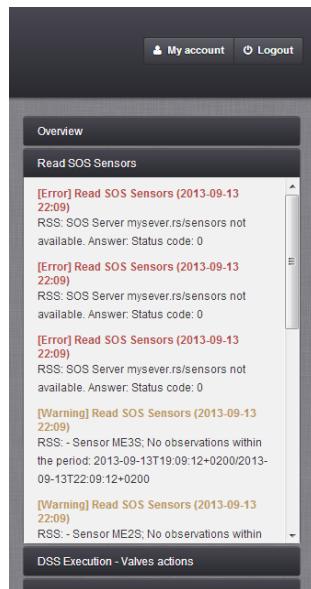


Figure 11 - Read SOS Sensors

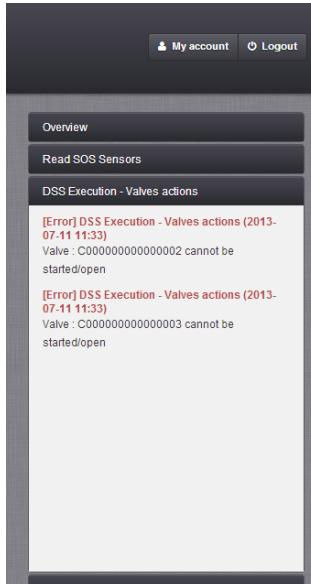


Figure 12 - DSS Execution - Valves actions

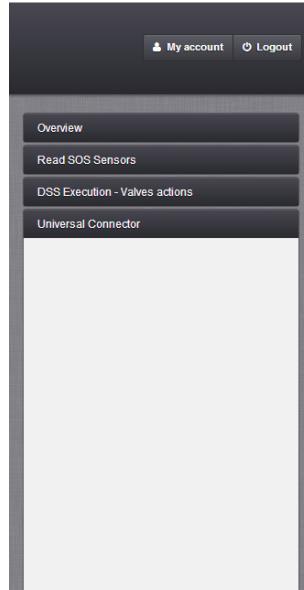


Figure 13 - Universal Connector

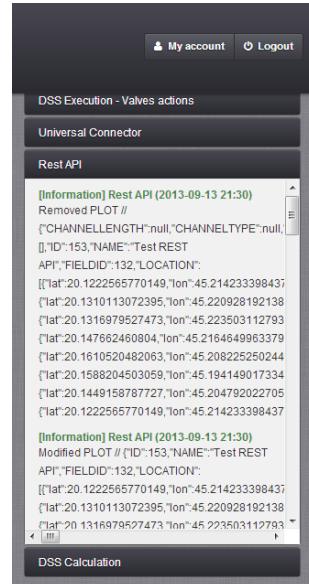


Figure 14 - Rest API

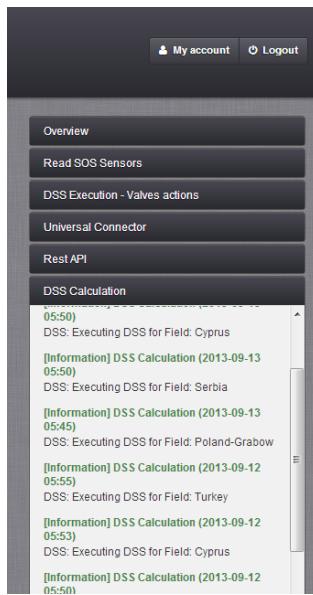


Figure 15 - DSS Calculation

One of the most important parts of this web application is the map - Figure 16. User can choose between different levels of layers by clicking on the cross sign in the right corner of the map and checking/unchecking appropriate boxes - Figure 17.

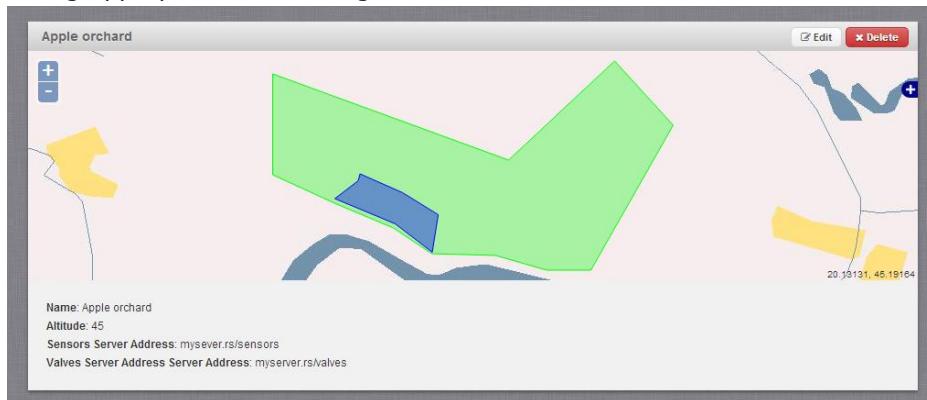


Figure 16 - Map

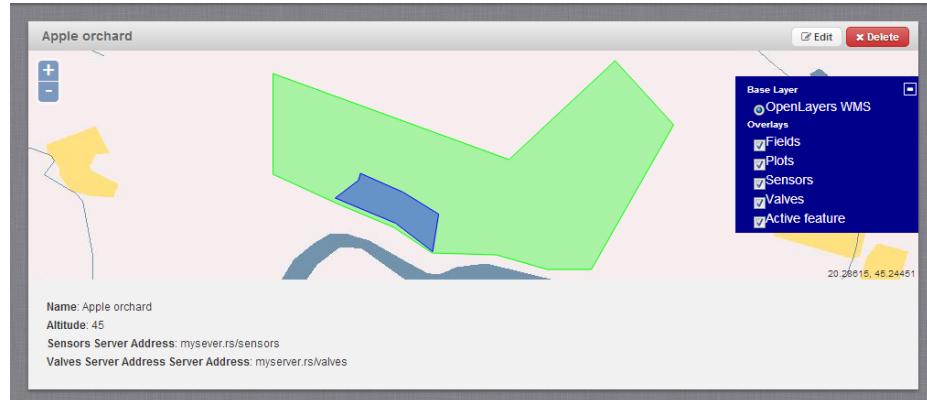


Figure 17 - Map options

Zooming in and zooming out can be done by clicking on the "+" and "-" signs in the left corner, or by scrolling the mouse - Figure 18. User can move the map by clicking and dragging the map to the wanted position.

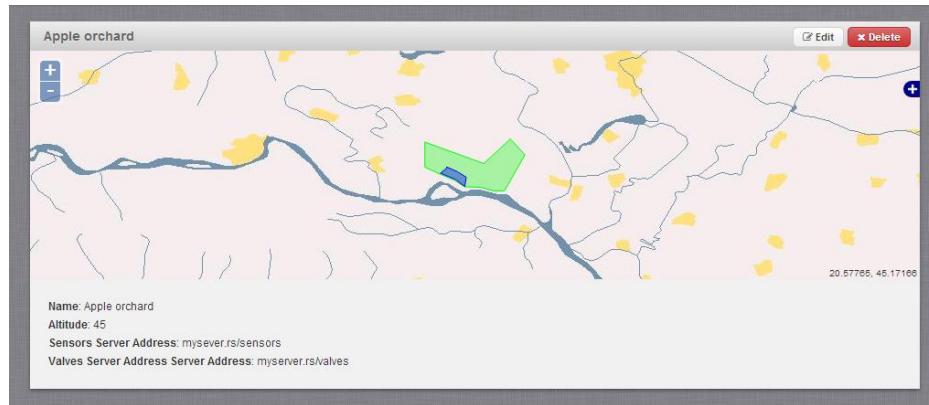


Figure 18 - Map zooming

1.5 Crop types management (admin)

The system administrator has the ability to create, edit or delete the Crop type.

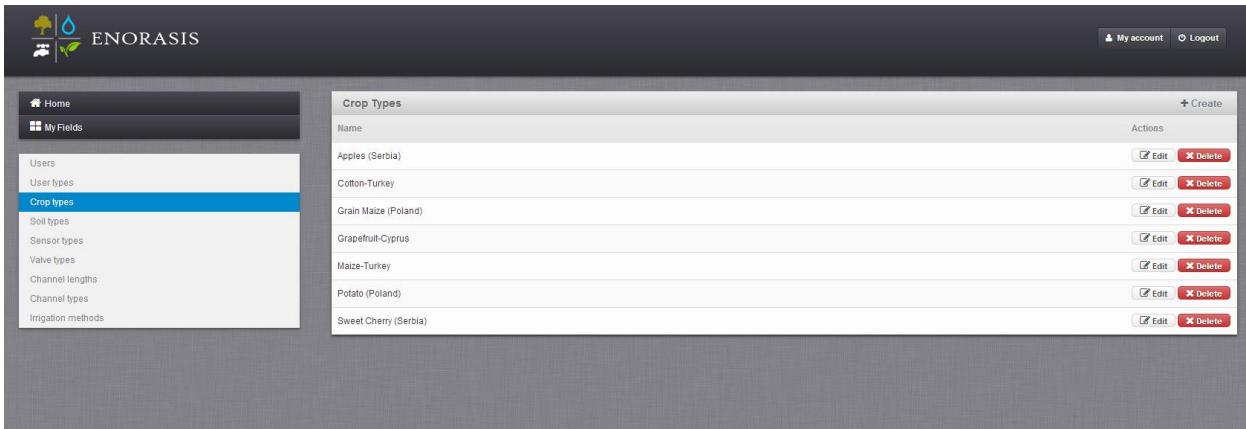


Figure 19 - Crop types management

The *Create* button is located in the top right corner - Figure 19. The Create form design is shown in Figure 20.

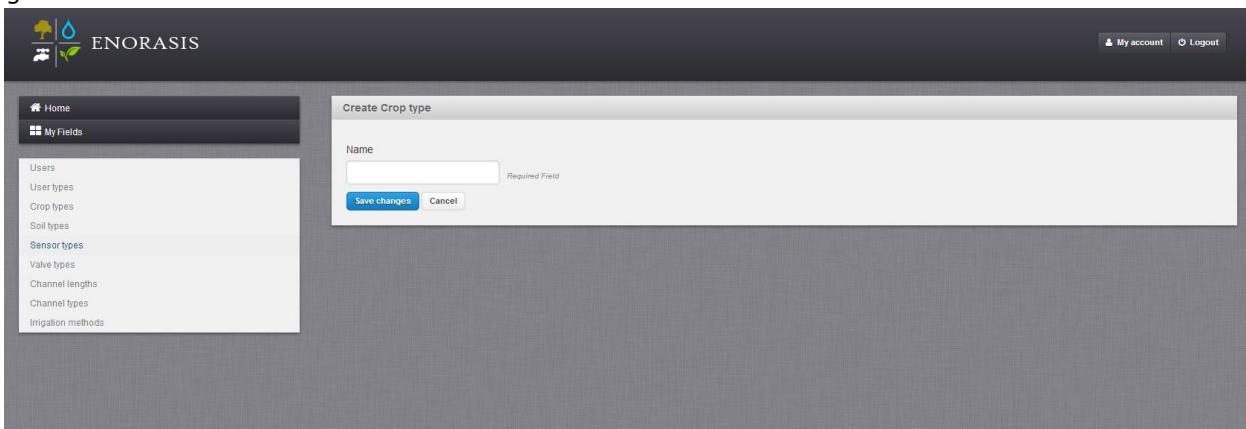


Figure 20 – Create Crop type

The only field which needs to be entered is the Crop name.

The administrator can change the Crop type by clicking on the *Edit* button located at the end of the line with the Crop name.

The Crop can be deleted by the administrator by clicking on the *Delete* button. Message "Are you sure you want to delete this record" will appear on the screen – Figure 21. The administrator needs to confirm his decision by pressing the *Delete record* button.

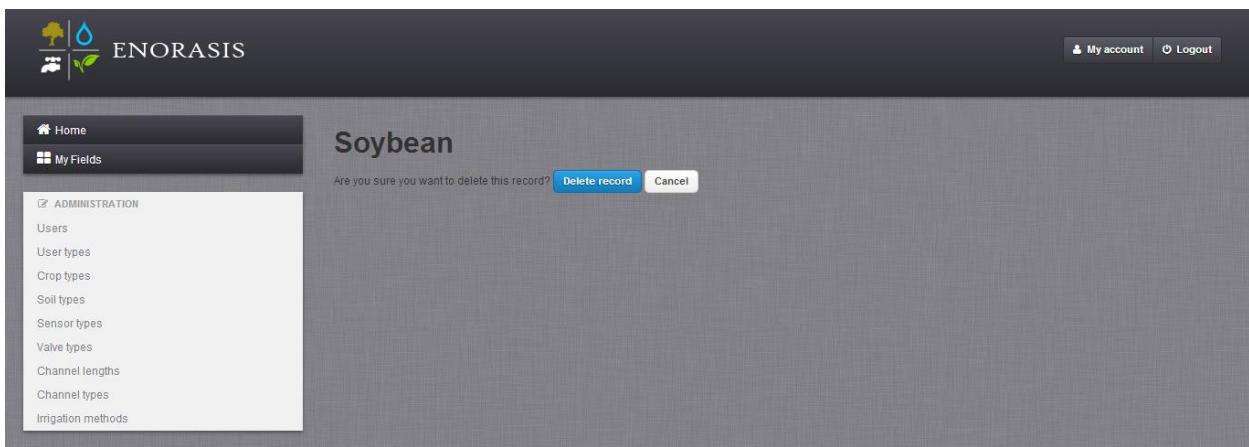


Figure 21 – Delete Crop type

1.6 Soil types management (admin)

The system administrator has the privileges to create, edit or delete the Soil type.

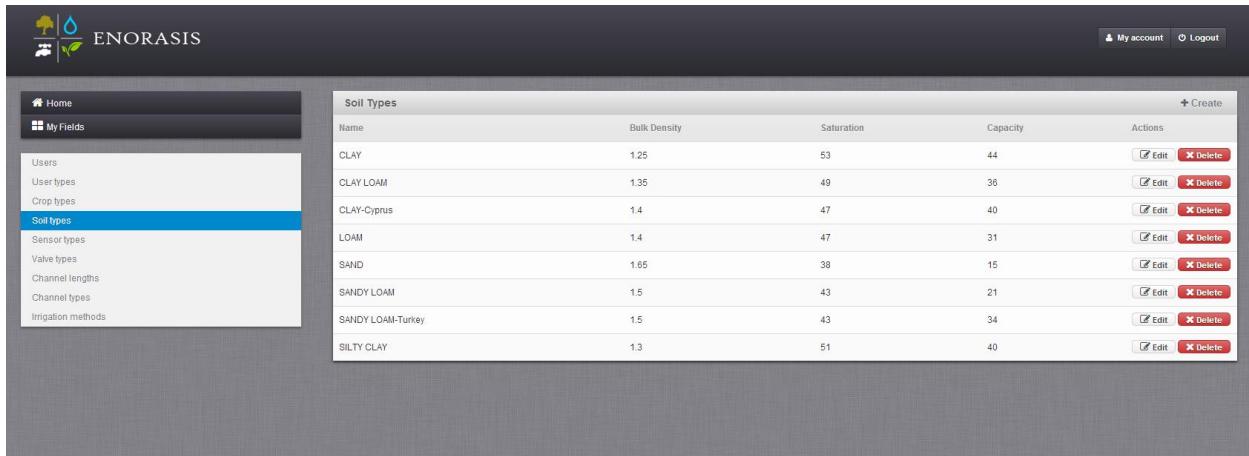


Figure 22 – Soil types management

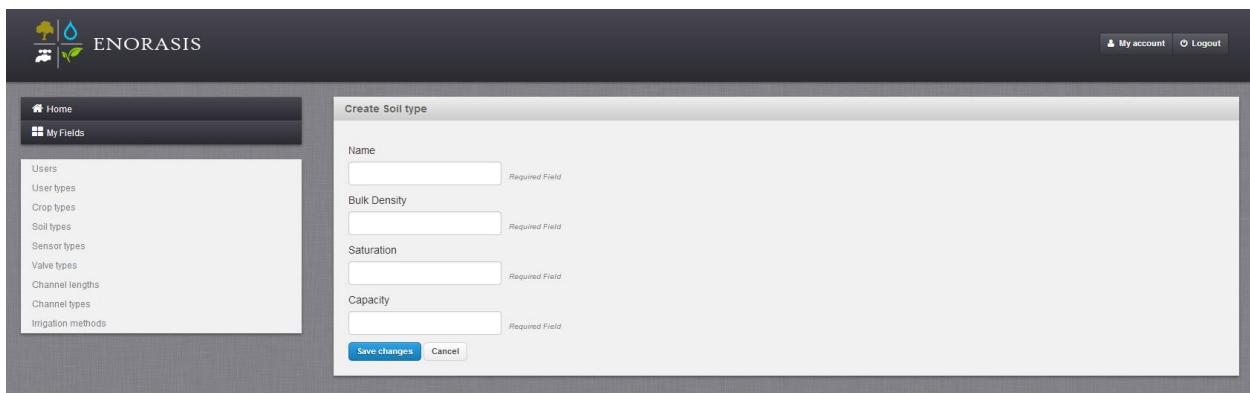
The Create button is located in the top right corner - Figure 22. The Create form design is shown in Figure 23.

All form fields are required:

- Name
- Bulk Density
- Saturation
- Capacity

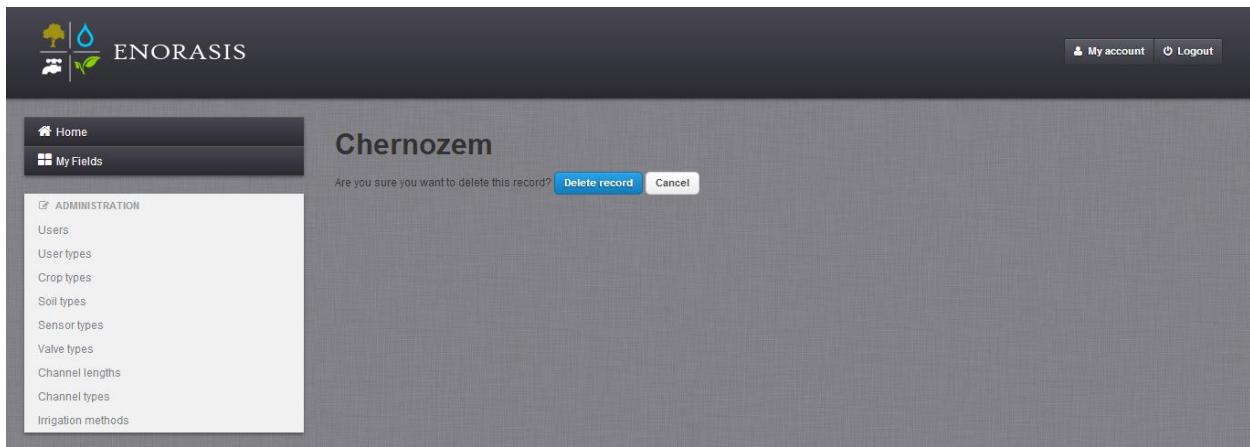
The administrator can change the Soil type data by clicking on the *Edit* button, which is located at the end of the line of its Soil type's name.

The Soil type can be deleted by the administrator by clicking on the *Delete* button. Message "Are you sure you want to delete this record?" will appear on the screen – Figure 24. The administrator needs to confirm his decision by pressing the *Delete record* button.



The screenshot shows the 'Create Soil type' form. The 'Name' field is required. The 'Bulk Density', 'Saturation', and 'Capacity' fields are also required. There are 'Save changes' and 'Cancel' buttons at the bottom.

Figure 23 – Create Soli type

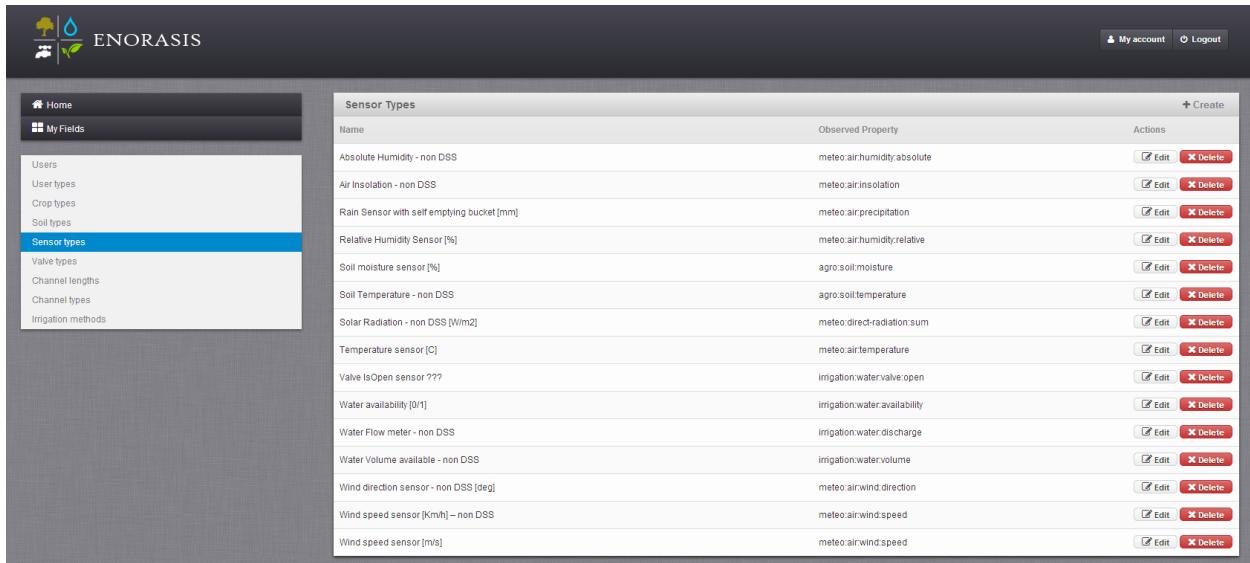


The screenshot shows a confirmation dialog for deleting the 'Chernozem' soil type. It asks 'Are you sure you want to delete this record?' with 'Delete record' and 'Cancel' buttons.

Figure 24 – Delete Soil type

1.7 Sensor types management (admin)

The system administrator has the ability to create, edit or delete the Sensor type.



The screenshot shows the 'Sensor Types' management page. It lists various sensor types with their names, observed properties, and edit/delete buttons. A 'Create' button is in the top right.

Name	Observed Property	Actions
Absolute Humidity - non DSS	meteo:air:humidity/absolute	<input checked="" type="checkbox"/> Edit <input type="button" value="Delete"/>
Air Insolation - non DSS	meteo:air:insolation	<input checked="" type="checkbox"/> Edit <input type="button" value="Delete"/>
Rain Sensor with self emptying bucket [mm]	meteo:air:precipitation	<input checked="" type="checkbox"/> Edit <input type="button" value="Delete"/>
Relative Humidity Sensor [%]	meteo:air:humidity/relative	<input checked="" type="checkbox"/> Edit <input type="button" value="Delete"/>
Soil moisture sensor [%]	agro:soil:moisture	<input checked="" type="checkbox"/> Edit <input type="button" value="Delete"/>
Soil Temperature - non DSS	agro:soil:temperature	<input checked="" type="checkbox"/> Edit <input type="button" value="Delete"/>
Solar Radiation - non DSS [W/m ²]	meteo:direct-radiation,sum	<input checked="" type="checkbox"/> Edit <input type="button" value="Delete"/>
Temperature sensor [C]	meteo:air:temperature	<input checked="" type="checkbox"/> Edit <input type="button" value="Delete"/>
Valve IsOpen sensor ???	irrigation:water:valve:open	<input checked="" type="checkbox"/> Edit <input type="button" value="Delete"/>
Water availability [0 1]	irrigation:water:availability	<input checked="" type="checkbox"/> Edit <input type="button" value="Delete"/>
Water Flow meter - non DSS	irrigation:water:discharge	<input checked="" type="checkbox"/> Edit <input type="button" value="Delete"/>
Water Volume available - non DSS	irrigation:water:volume	<input checked="" type="checkbox"/> Edit <input type="button" value="Delete"/>
Wind direction sensor - non DSS [deg]	meteo:air:wind:direction	<input checked="" type="checkbox"/> Edit <input type="button" value="Delete"/>
Wind speed sensor [Kmh] - non DSS	meteo:air:wind:speed	<input checked="" type="checkbox"/> Edit <input type="button" value="Delete"/>
Wind speed sensor [m/s]	meteo:air:wind:speed	<input checked="" type="checkbox"/> Edit <input type="button" value="Delete"/>

Figure 25 - Sensor types management

The *Create* button is located in the top right corner - Figure 25. Create form design is shown in Figure 26. The required fields are:

- Name
- Observed Property

The administrator can change the User data by clicking on the *Edit* button located at the end of the line of its sensor type's name.

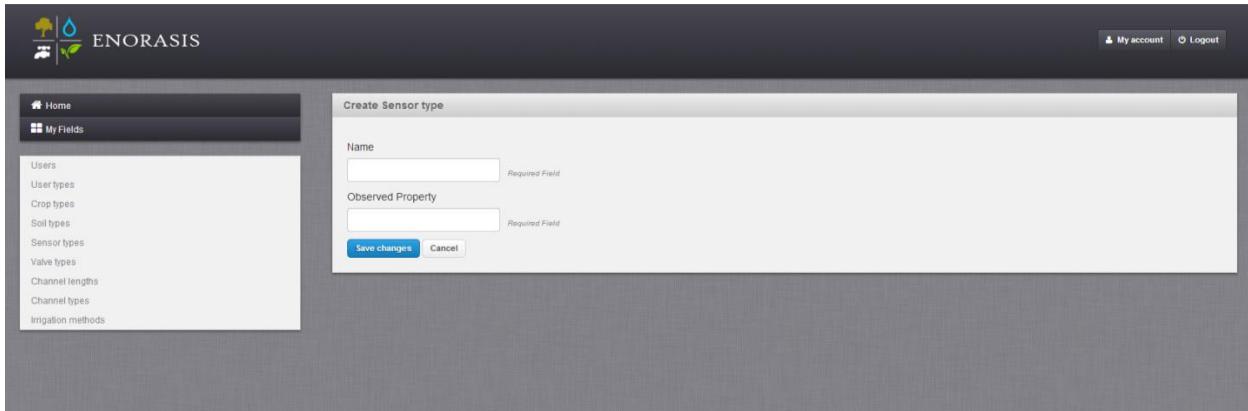


Figure 26 – Create Sensor type

The Sensor type can be deleted by the administrator by clicking on the *Delete* button. Message "Are you sure you want to delete this record?" will appear on the screen – Figure 27. The administrator needs to confirm his decision by pressing the *Delete record* button.

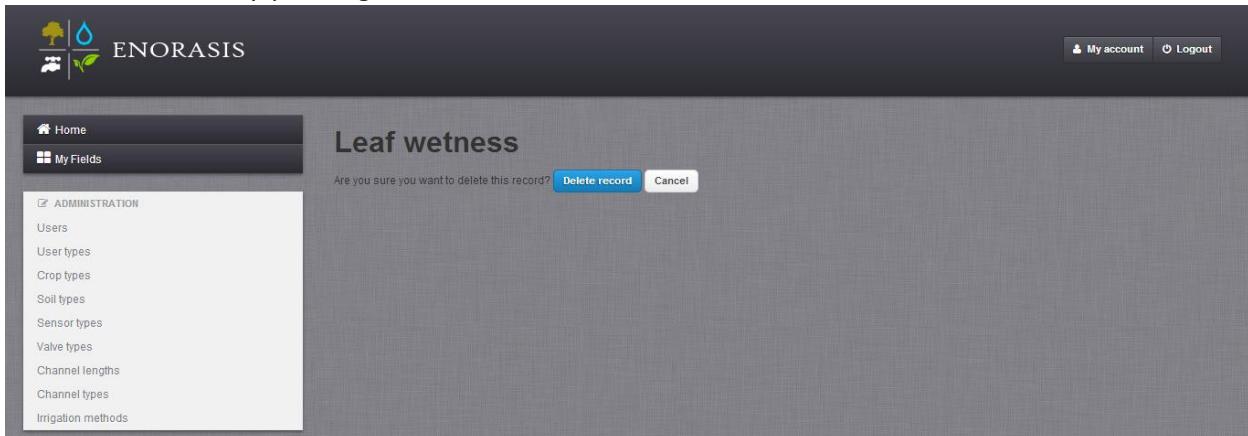
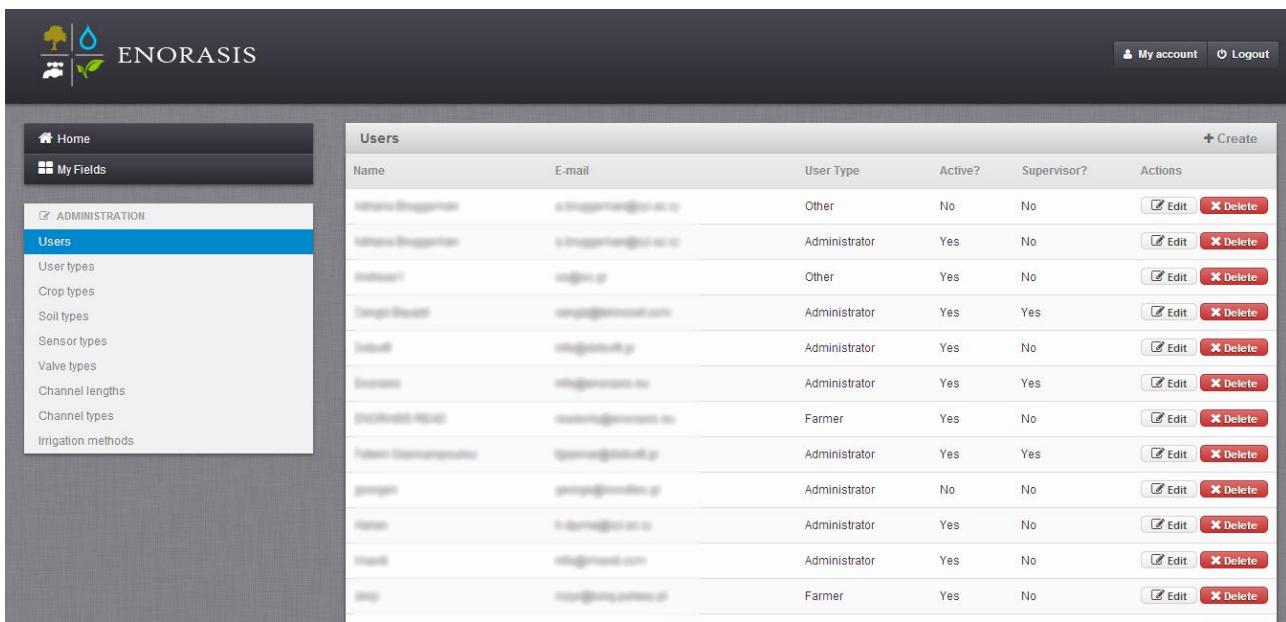


Figure 27 – Delete Sensor type

1.8 Users management (admin)

The system administrator has privileges to create, edit or delete the User. The Users management page is shown in Figure 28.



Name	E-mail	User Type	Active?	Supervisor?	Actions
Administrator	admin@enorasis.eu	Other	No	No	<input checked="" type="button"/> Edit <input type="button"/> Delete
Administrator	admin@enorasis.eu	Administrator	Yes	No	<input checked="" type="button"/> Edit <input type="button"/> Delete
Administrator	admin@enorasis.eu	Other	Yes	No	<input checked="" type="button"/> Edit <input type="button"/> Delete
Administrator	admin@enorasis.eu	Administrator	Yes	Yes	<input checked="" type="button"/> Edit <input type="button"/> Delete
Administrator	admin@enorasis.eu	Administrator	Yes	No	<input checked="" type="button"/> Edit <input type="button"/> Delete
Administrator	admin@enorasis.eu	Administrator	Yes	Yes	<input checked="" type="button"/> Edit <input type="button"/> Delete
Administrator	admin@enorasis.eu	Farmer	Yes	No	<input checked="" type="button"/> Edit <input type="button"/> Delete
Administrator	admin@enorasis.eu	Administrator	Yes	Yes	<input checked="" type="button"/> Edit <input type="button"/> Delete
Administrator	admin@enorasis.eu	Administrator	No	No	<input checked="" type="button"/> Edit <input type="button"/> Delete
Administrator	admin@enorasis.eu	Administrator	Yes	No	<input checked="" type="button"/> Edit <input type="button"/> Delete
Administrator	admin@enorasis.eu	Administrator	Yes	No	<input checked="" type="button"/> Edit <input type="button"/> Delete
Administrator	admin@enorasis.eu	Farmer	Yes	No	<input checked="" type="button"/> Edit <input type="button"/> Delete

Figure 28 – User management

The *Create* button is located in the top right corner - Figure 28. The *Create User* procedure is the same as the *Registration* procedure described in chapter 1.1.

The administrator can change the User data by clicking on the *Edit* button located at the end of the line with the name of the User.

The User can be deleted by the administrator by clicking on the *Delete* button. Message "Are you sure you want to delete this record?" will appear on the screen – Figure 29. The administrator needs to confirm his decision by pressing the *Delete record* button.

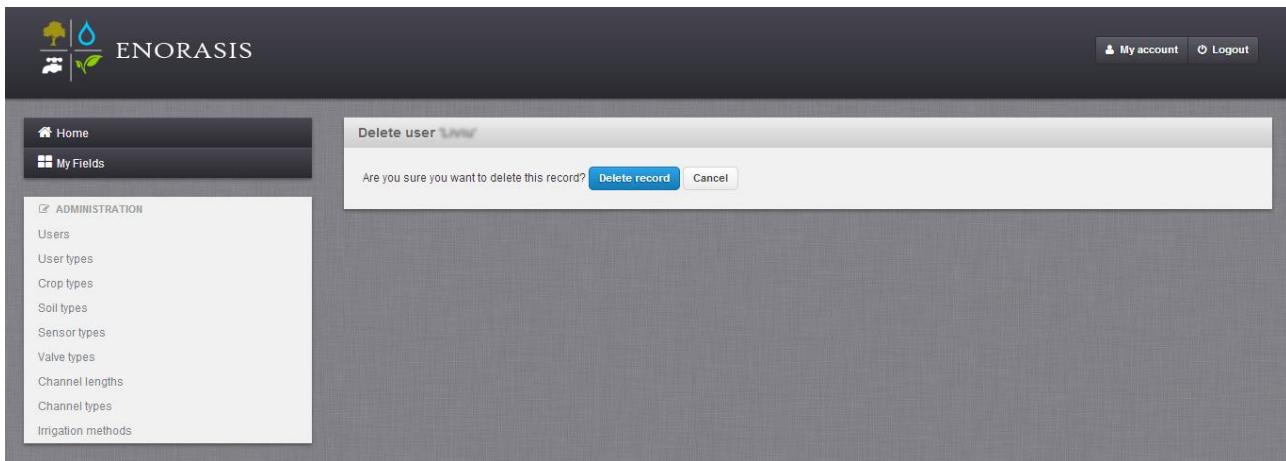
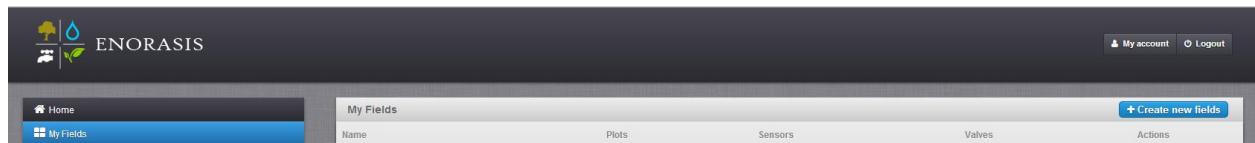


Figure 29 – Delete confirmation

1.9 Insert/Update Field

The User can create and update the Fields by clicking on the *My Fields* menu option, the *My Fields* grid will appear as shown in Figure 30.



Name	Plots	Sensors	Valves	Actions
				<input type="button"/> + Create new fields

Figure 30 – My Fields

In order to create a new field, the User needs to click on the *Create new field* button in the right corner of the screen. New *Create Field* form will appear as shown in Figure 31. The User is expected to draw the shape of the field on exact location by clicking on the *Draw* button located under the map. The required fields are:

- *Name*
- *Size*

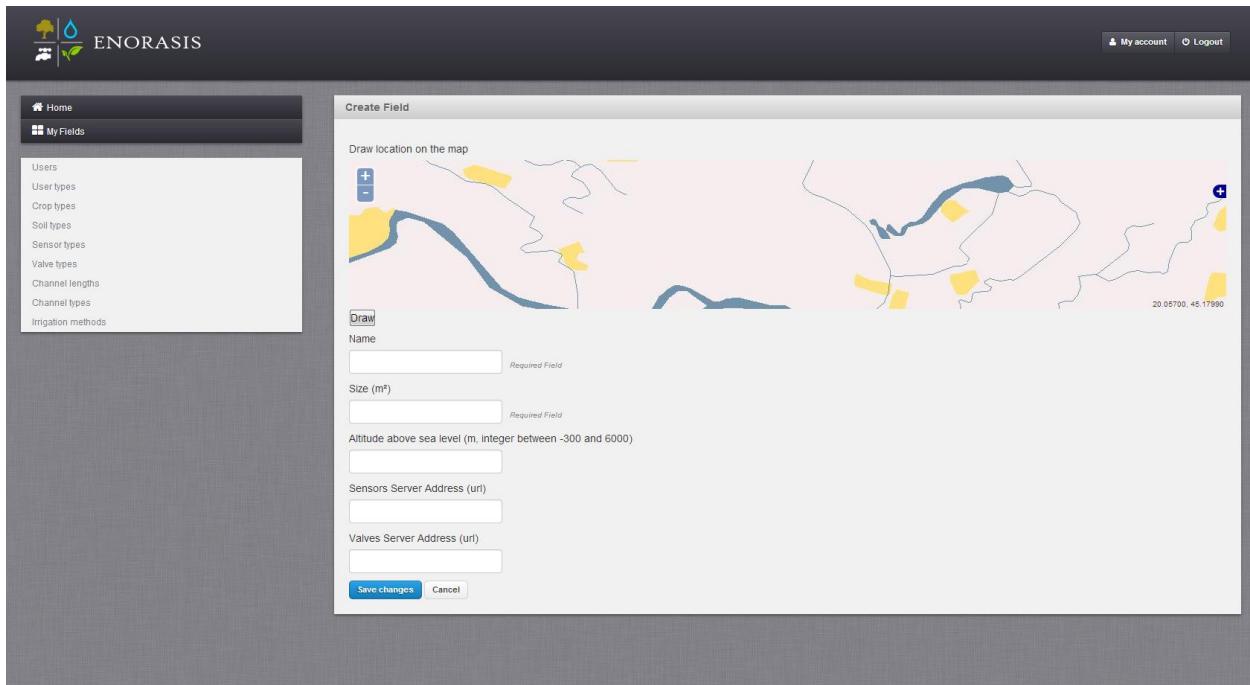


Figure 31 – Create Field

Optional fields are:

- Altitude above sea level
- Sensors server address
- Valves server address

Drawing the Field is very simple. The User needs to place the mouse cursor at the desired place and to click on the left mouse button. When the shape of the Field is satisfactory the User just needs to double click on the left mouse button. In the *Modify* mode - Figure 32 – the User can change the shape of the Field by clicking on desired point and dragging it to the correct place. If any of points is unnecessary the User can simply delete it by placing mouse cursor over that point and clicking the Delete button on the keyboard.



Figure 32 – Drawing the field

If the User selects and drags the light colored point, then a new one will appear in the middle of the line, between light colored point and its neighbors and light colored point will become darker.

When the User is satisfied with the shape and position of the field he/she just needs to press the *Done* button or the *Reset* button if he/she is completely unsatisfied.



Figure 33 – Drawing finished

If any changes need to be done the User can again switch to the *Modify mode* by clicking on the *Modify* button.

The new field will appear in the *My Fields* grid - Figure 34.

My Fields				
Name	Plots	Sensors	Valves	Actions
Apple orchard	0 plots	0 sensors	0 valves	 

Figure 34 – My Fields

If the User is the owner of the Field he/she can also delete the field by clicking on the *Delete* button located at the end of the line of its field's name.

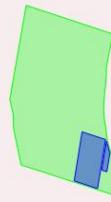
1.10 Field view

In order to view the specific Field, the User needs to select the *My Fields* in the menu and then to select an appropriate Field. Web application will show five grids: Map of the Field, Related Plots, Related Sensors, Related Valves and Field Permissions as shown in Figure 35.

- [Home](#)
- [My Fields](#)
- [Apple orchard](#)
- [Cypress](#)
- [Poland-Grabow](#)
- [Serbia](#)
- [AG1](#)
- [C1](#)
- [Turkey](#)

- [ADMINISTRATION](#)
- [Users](#)
- [User types](#)
- [Crop types](#)
- [Soil types](#)
- [Sensor types](#)
- [Valve types](#)
- [Channel lengths](#)
- [Channel types](#)
- [Irrigation methods](#)

Serbia



45 31353, 19 50466

Name: Serbia
Altitude: 150
Sensors Server Address: Valves Server Address Server Address: http://e.panonit.com:8085

Related Plots

Name	Irrigation	Sensors	Valves	Actions
AG1		9 Sensors	1 Valves	Edit Delete
C1		7 Sensors	1 Valves	Edit Delete

Related Sensors

Name	Type	Last reading	Actions
FTS_1_AH1	Relative Humidity Sensor [%]	2013-09-08 09:11:28	Edit Delete
FTS_1_AT1	Temperature sensor [C]	2013-09-08 09:11:28	Edit Delete
FTS_1_PP1	Rain Sensor with self emptying bucket [mm]	2013-09-08 09:11:28	Edit Delete
FTS_1_SM1	Soil moisture sensor [%]	2013-09-08 09:12:25	Edit Delete
FTS_1_SM2	Soil moisture sensor [%]	2013-09-08 09:12:25	Edit Delete
FTS_1_WD1	Wind direction sensor - non DSS [deg]	2013-09-08 09:11:28	Edit Delete
FTS_1_WS1	Wind speed sensor [Km/h] - non DSS	2013-09-08 09:11:28	Edit Delete
FTS_2_SM1	Soil moisture sensor [%]	2013-09-08 18:08:50	Edit Delete
FTS_2_SM2	Soil moisture sensor [%]	2013-09-08 18:08:51	Edit Delete
FTS_3_SM1	Soil moisture sensor [%]	2013-09-08 18:11:16	Edit Delete
FTS_3_SM2	Soil moisture sensor [%]	2013-09-08 18:11:17	Edit Delete

Related Valves

Name	Type	Actions
Test Serbia 2	Standard	Edit Delete
Test Serbia valve	Standard	Edit Delete

Field Permissions

Name	Email	Role	Approved	Actions
Dotsoft	info@dotsoft.gr	READ ONLY	Yes	Delete
Imaxdi	info@imaxdi.com	OWNER	Yes	Delete
Enorasis	info@enorasis.eu	OWNER	Yes	Delete
ENORASIS READ	readonly@enorasis.eu	READ ONLY	Yes	Delete
stekes	stavros@dotsoft.gr	READ-WRITE	Yes	Delete
Vladan Minic	minic@uns.ac.rs	READ-WRITE	Yes	Delete
Cengiz Bayazit	cengiz@teknoiset.com	READ-WRITE	Yes	Delete
Jerzy	kozr@iung.pulawy.pl	READ ONLY	Yes	Delete

Figure 35 – Field view

Version – issue date: 0.7 – 11/10/2013

Page 15

The Map of the Field shows all the details about the Field. The User has two buttons: Edit for editing the shape and the field details and Delete button to delete the selected Field.

The *Related Plots* grid offers the possibility to the User to turn on/off automatic irrigation, create, edit or delete the plot, or to click on the name of the plot and view the plot.

The *Related Sensors* and the *Related Valves* are similar with their functionalities. The User can create, edit or delete the sensor/valve, or to click on the name of the sensor/valve and view them.

The User can use the *Field Permissions* to give a privilege to any User to Read/Write or just to Read selected plot.

1.11 Insert/Update Plot

In order to create the Plot, the User needs to select the Field where the Plot is located and to click on the *Create* button in the *Related Plots* grid - Figure 36

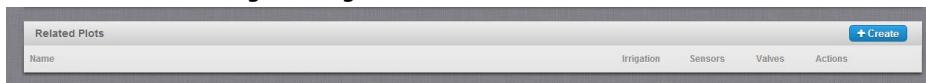


Figure 36 – Related Plots

The User is expected to draw the shape of the field on exact location by clicking on the *Draw* button located under the map. Drawing the Plot is very simple. The User needs to place the mouse cursor at the desired place and to click on the left mouse button. When the shape of the Plot is satisfactory the User just needs to double click on the left mouse button. In the *Modify mode* the User can change the shape of the Plot by clicking on desired point and dragging it to the correct place. If any of points is unnecessary the User can simply delete it by placing mouse cursor over that point and clicking the *Delete* button on the keyboard. If the User selects and drags the light colored point, then a new one will appear in the middle of the line, between the light colored point and its neighbors and light colored point will become darker. When the User is satisfied with the shape and the position of the Plot he/she just needs to press the *Done* button or the *Reset* button if he/she is completely unsatisfied.

The required fields are:

- Name
- Crop Type – *drop list*
- Soil Type – *drop list*
- Channel Type – *drop list*
- Channel Length – *drop list*
- Irrigation Method Efficiency – *drop list*
- Size in square meters
- Slope in degrees (degrees)
- Day of year of sowing (0-365)
- Water price (Euro/m³)
- Crop yield price (Euro/t)
- Yield without water stress (t/ha)
- Costs of irrigation system work (Euro/m³)
- Other costs of production minus subsidies (Euro/ha)
- Minimal profitable amount of irrigation (mm)
- Harvest day (0-365)

Mandatory field is: Enable automatic irrigation.

The new Plot will be shown in the *Related Plots* grid as shown in Figure 38. The User has option to change the shape of the Plot or any value from the fields listed above by clicking on the *Edit* button in the *Related Plots* grid. The User has also the ability to delete the Plot by clicking on the *Delete* button as

shown in Figure 38. If the User has decided to delete the Plot he/she needs to confirm his/her decision by pressing the *Delete record* button – Figure 39.

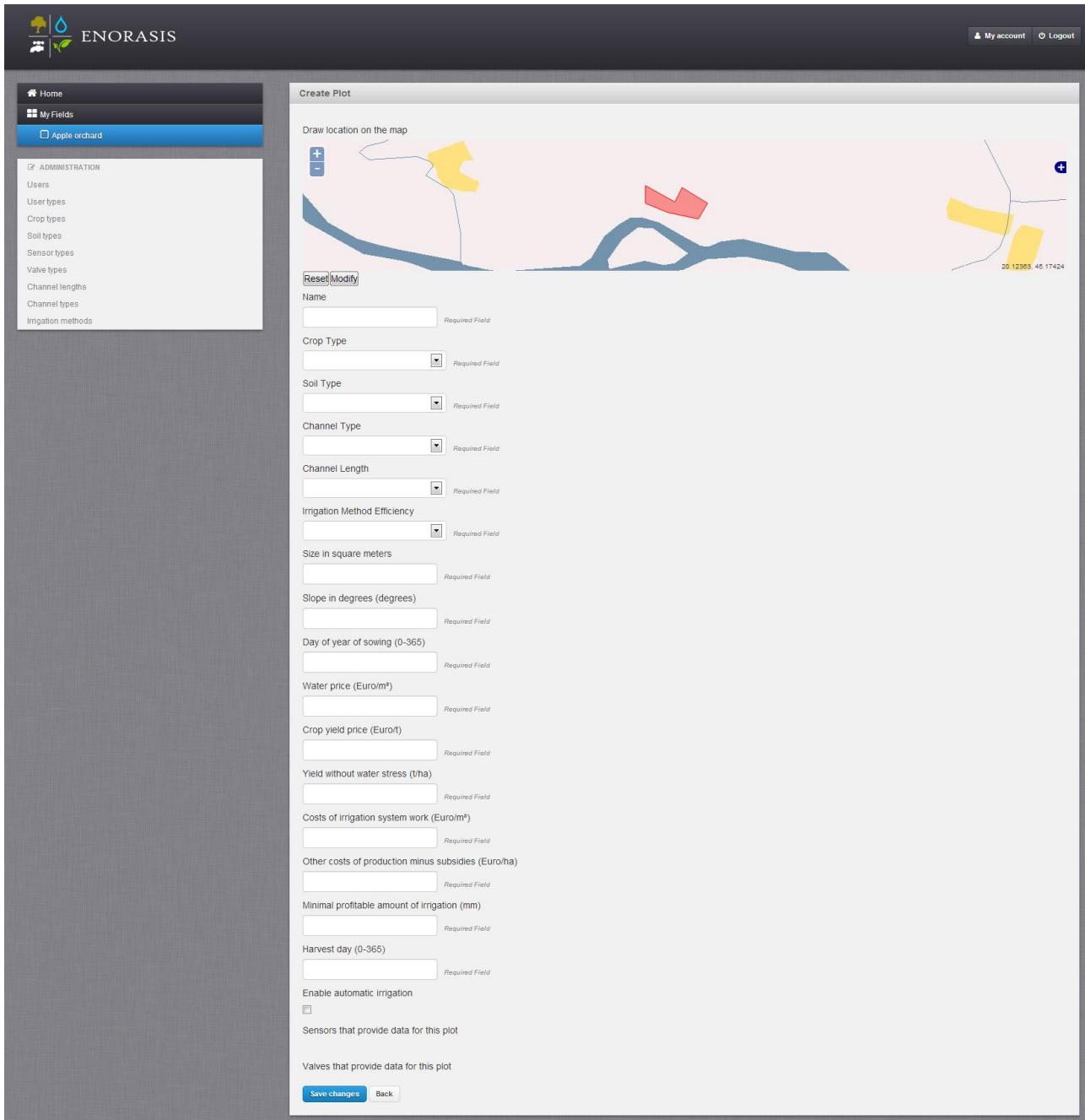


Figure 37 – Create plot

Related Plots		+ Create
Name	Jonathan Gold	Irrigation Sensors Valves Actions
		<input checked="" type="button"/> Sensors <input type="button"/> Valves <input type="checkbox"/> Edit <input type="button"/> Delete

Figure 38 – Updated Related Plots

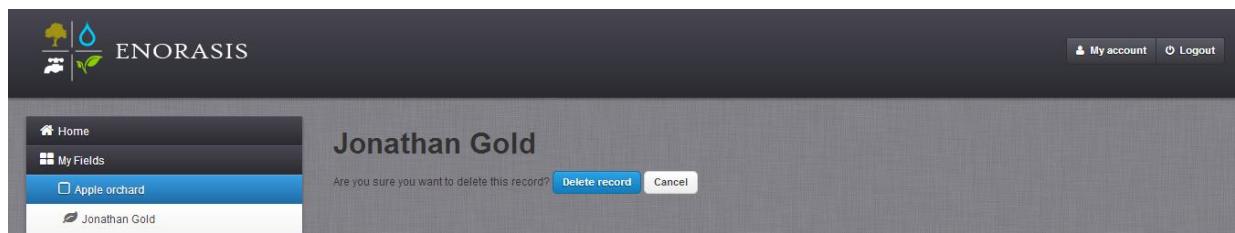


Figure 39 - Delete Plot

1.12 Plot View

Home

My Fields

- Apple orchard
- Cypress
- Poland-Grabow
- Serbia
- AG1
- C1
- Turkey

ADMINISTRATION

- Users
- User types
- Crop types
- Soil types
- Sensor types
- Valve types
- Channel lengths
- Channel types
- Irrigation methods

C1

+
-
C1



Name: C1
Cost of work: 0.1
Crop type: Sweet Cherry (Serbia)
Crop yield price: 851
Minimal profitable amount of irrigation: -1
Other costs: 0.1
Date of sowing: 15
Size: 100
Slope: 0
Soil type: CLAY LOAM
Water price: 0.1
Yield without water stress: 3.3
Automatic irrigation enabled:
Harvest day:

Dss Results

Liters to be watered today		Actions
0		OFF

Weather Forecast

INSDATE	DATE	SOURCE	PPT_PRB	PPT_AMT	WND_SPD	SLR_RAD	MIN_TMP	MAX_TMP	REL_HUM
2013-09-08	2013-09-10	1	100	4.6	1.91	20.82	17.62	27.62	61.88
2013-09-08	2013-09-10	3	100	8.15	2.88	18.71	18.08	28.76	61.88
2013-09-08	2013-09-09	1	0	0.01	2.5	22.38	10.74	27.38	49.86
2013-09-08	2013-09-09	3	0	0.02	2.53	21.99	11.07	27.27	49.66
2013-09-07	2013-09-09	-1	0	0	1.87	21.64	10.81	26.52	64.43
2013-09-07	2013-09-09	-3	0	0	1.92	22.33	11.22	26.83	63.67
2013-09-08	2013-09-08	1	0	0	1.4	22.91	9.69	26.1	47.73
2013-09-07	2013-09-08	-3	0	0	1.54	22.69	9.31	24.88	52.89
2013-09-05	2013-09-08	-1	0	0	1.58	22.52	7.49	24.85	57.78
2013-09-05	2013-09-08	-2	0	0	1.34	22.53	7.4	25.13	52.05
2013-09-06	2013-09-08	-3	0	0	1.57	22.48	8.13	24.92	57.44
2013-09-07	2013-09-08	-1	0	0	1.61	22.7	9.53	24.87	52.5
2013-09-08	2013-09-08	3	0	0	1.29	22.91	9.74	25.96	48.21

Related Sensors

View Sensor Data			+ Create
Name	Type	Last reading	Actions
FTS_1_AH1	Relative Humidity Sensor [%]	08/09/2013 09:11:28	<input checked="" type="checkbox"/> Add measurements <input type="checkbox"/> Edit <input type="checkbox"/> Delete
FTS_1_AT1	Temperature sensor [C]	08/09/2013 09:11:28	<input checked="" type="checkbox"/> Add measurements <input type="checkbox"/> Edit <input type="checkbox"/> Delete
FTS_1_PP1	Rain Sensor with self emptying bucket [mm]	08/09/2013 09:11:28	<input checked="" type="checkbox"/> Add measurements <input type="checkbox"/> Edit <input type="checkbox"/> Delete
FTS_1_WD1	Wind direction sensor - non DSS [deg]	08/09/2013 09:11:28	<input checked="" type="checkbox"/> Add measurements <input type="checkbox"/> Edit <input type="checkbox"/> Delete
FTS_1_WS1	Wind speed sensor [Km/h] - non DSS	08/09/2013 09:11:28	<input checked="" type="checkbox"/> Add measurements <input type="checkbox"/> Edit <input type="checkbox"/> Delete
FTS_3_SM1	Soil moisture sensor [%]	08/09/2013 18:11:16	<input checked="" type="checkbox"/> Add measurements <input type="checkbox"/> Edit <input type="checkbox"/> Delete
FTS_3_SM2	Soil moisture sensor [%]	08/09/2013 18:11:17	<input checked="" type="checkbox"/> Add measurements <input type="checkbox"/> Edit <input type="checkbox"/> Delete

Related Valves

+ Create		
Name	Type	Actions
Test Serbia 2	Standard	<input checked="" type="checkbox"/> Add water irrigation amount <input type="checkbox"/> Edit <input type="checkbox"/> Delete

Figure 40 – Plot View

Version – issue date: 0.7 – 11/10/2013

Page 19

In order to view the specific Plot, the User needs to click on the *My Fields* in the menu, to select an appropriate Field and then to click on the Plot. Web application will show five grids: Map of the Plot, DSS Results, Weather Forecast, Related Sensors and Related Valves as shown in Figure 40.

The Map of the Plot shows all details about the Plot. The User has four buttons: *Edit* for editing the shape and the details, *End Season* to indicate that season is over, *Start Season* to indicate that season has just begun and the *Delete* button to delete the selected Plot.

DSS Results shows the results of the Decision Support System for current day. Clicking the *View DSS Details* button will open page like the one shown in Figure 41. The User can go back by clicking on *Show plot details* button in upper right corner, or to expand grids by clicking on the *Show* buttons.

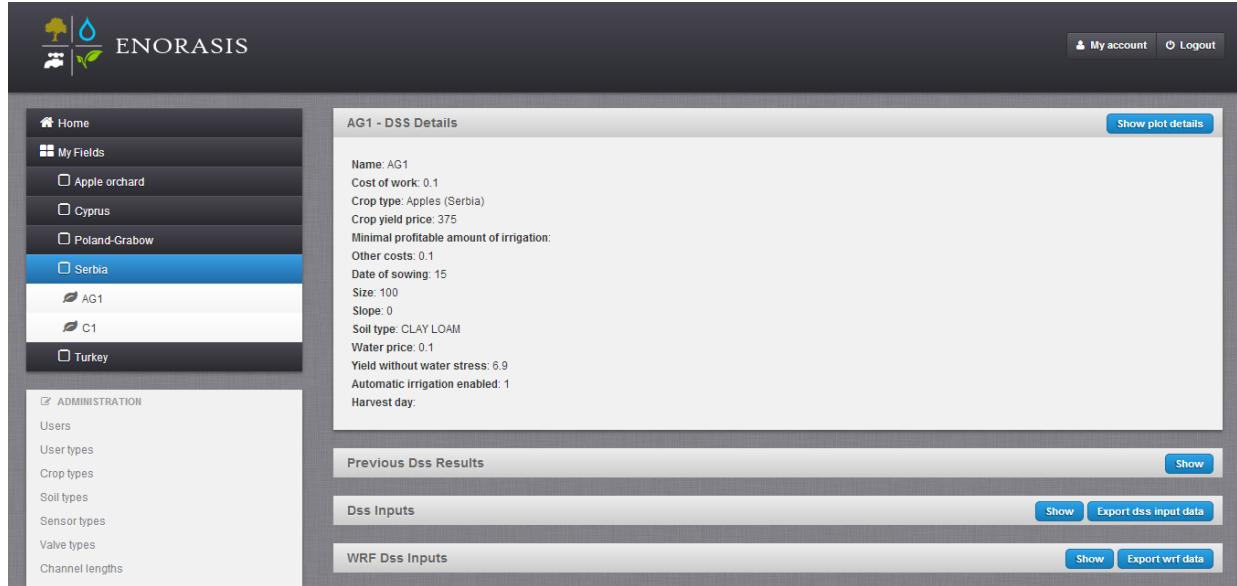


Figure 41 - View DSS Details

The expanded grids will be similar to those shown in Figure 42, Figure 43 and Figure 44.

Previous Dss Results	
Datetime	Liters to be watered
2013-09-08 05:52:25	0
2013-09-07 05:51:51	0
2013-09-06 05:53:42	0
2013-09-05 11:41:41	0
2013-09-02 05:58:35	0
2013-09-01 05:51:23	0
2013-08-31 05:51:42	0
2013-08-30 05:53:07	0
2013-08-29 05:51:39	0
2013-08-28 05:51:14	0
2013-08-27 05:52:47	0
2013-08-26 05:53:40	0
2013-08-25 05:51:31	0
2013-08-24 05:51:25	0
2013-08-23 05:50:42	0
2013-08-22 05:52:49	0

Figure 42 - Previous DSS Results

The *Previous DSS Results* grid shows the DSS results for a previous period. The *DSS Input* grid shows the inputs for the DSS system coming from sensor measurements deployed from in the fields and the *WRF DSS Inputs* show the inputs for the DSS system coming from the weather forecast. The input data can be exported by clicking on *Export DSS input data* or *Export WRF data* buttons.

Dss Inputs						
Date	P	Tmin (oC)	Tmax (oC)	RH	RS (MJ)	U
2013-09-09	0	11.67	11.67	74		
2013-09-08	0	6.67	13.89	90.571428		
2013-09-07						
2013-09-06	0.2	0	9.44	94.333333		
2013-09-05	0	0	13.33	93.857142		
2013-09-04	0	0	0	95.5		
2013-09-03	0	0	0	90		
2013-09-02						
2013-09-01	0	12.22	13.33	90.75		
2013-08-31	2.2	0	13.89	96		
2013-08-30	1.6	12.22	20	93.5		
2013-08-29	1.6	14.44	20	94.25		
2013-08-28	7	16.11	17.22	96.3		
2013-08-27	0.2	14.44	16.11	82.714285		
2013-08-26	1.6	15.55	17.22	96.90909		
2013-08-25	34.2	13.33	19.44	95.0625		

Figure 43 - DSS Inputs

WRF Dss Inputs									
INSDATE	DATE	SOURCE	PPT_PRB	PPT_AMT	WIND_SPD	SLR_RAD	MIN_TMP	MAX_TMP	REL_HUM
2013-09-09	2013-09-11	3	100	11.48	2.22	12.99	14.83	25.37	79.68
2013-09-09	2013-09-11	2	100	17.91	2.21	9.62	17.5	22.9	81
2013-09-09	2013-09-11	1	100	13.87	1.96	14.81	15.83	25.35	81.54
2013-09-09	2013-09-10	1	94	5.75	1.9	16.91	13.96	28.17	75.95
2013-09-09	2013-09-10	3	60	1.42	2.05	21.58	13.97	28.47	72.04
2013-09-09	2013-09-10	2	44	0.02	2.38	21.42	16.08	29.61	60.62
2013-09-08	2013-09-10	-1	100	4.6	1.91	20.82	17.62	27.62	61.86
2013-09-08	2013-09-10	-3	100	8.15	2.88	18.71	18.08	28.76	61.88
2013-09-09	2013-09-09	1	66	0.57	1.55	5.91	12.16	25.31	59.69
2013-09-07	2013-09-09	-3	0	0	1.92	22.33	11.22	26.83	63.67
2013-09-08	2013-09-09	-1	0	0.01	2.5	22.38	10.74	27.38	49.86
2013-09-07	2013-09-09	-1	0	0	1.87	21.64	10.81	26.52	64.43
2013-09-09	2013-09-09	2	0	0	2.36	14.45	15.4	27.02	45.67
2013-09-09	2013-09-09	3	19	0.41	1.5	6.26	12.3	24.77	60.6
2013-09-08	2013-09-09	-3	0	0.02	2.53	21.99	11.07	27.27	49.66
2013-09-05	2013-09-08	-1	0	0	1.58	22.52	7.49	24.85	57.78
2013-09-07	2013-09-08	-1	0	0	1.61	22.7	9.53	24.87	52.5
2013-09-07	2013-09-08	-3	0	0	1.54	22.69	9.31	24.88	52.89

Figure 44 - WRF DSS Inputs

1.13 Insert/Update Valves

The User firstly needs to select a desired Field and belonging Plot. The *Related Valves* grid is located at the bottom of the page - Figure 45.

Related Valves		
Name	Type	Actions
		+ Create

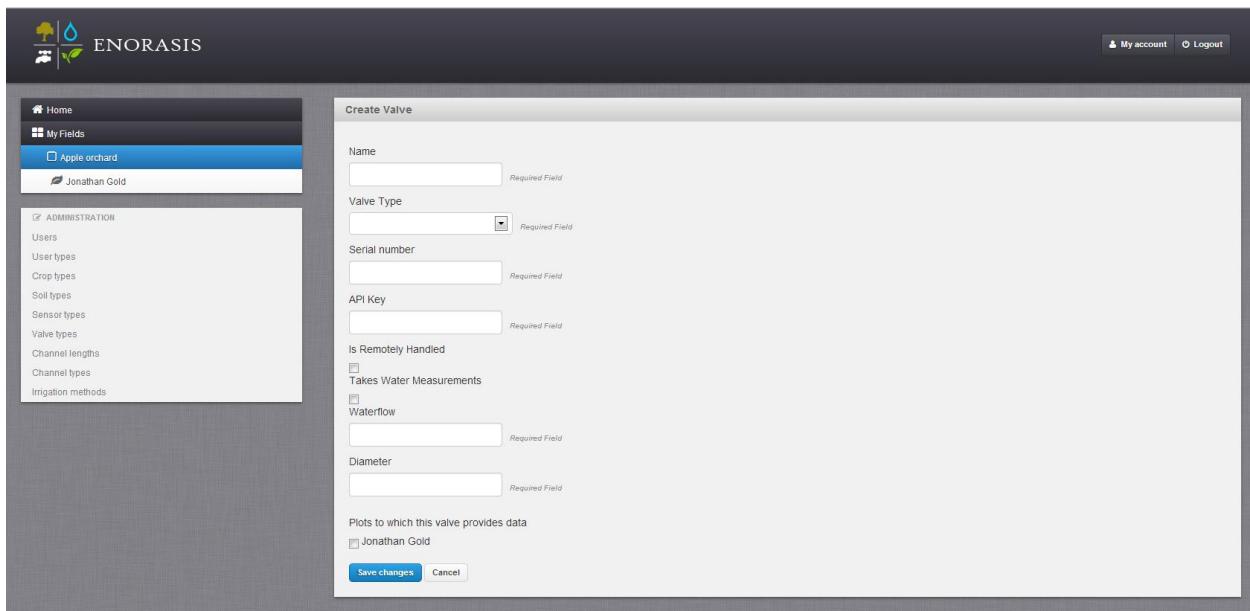
Figure 45 – Related Valves

After clicking on the *Create* button the *Create Valves* form will be open as it shown in Figure 46. The required fields are:

- Name
- Valve type – *drop list*
- Serial number
- API key
- Water flow
- Diameter

The mandatory boxes are:

- Is remotely handled
- Takes water measurements
- Plots to which this valve provides data



The screenshot shows the 'Create Valve' form. It includes fields for Name, Valve Type, Serial number, API Key, Is Remotely Handled, Takes Water Measurements, Waterflow, Diameter, and Plots to which this valve provides data. Buttons for 'Save changes' and 'Cancel' are at the bottom.

Figure 46 – Create Valve

After filling all the fields and saving the changes, then a new valve will be listed in the *Related Valves* grid.

Related Valves		
Name	Type	Actions
Main apple valve		<input type="button" value="Edit"/> <input type="button" value="Delete"/>

Figure 47 – Updated Related Valves

1.14 Valve view

The User firstly needs to select a desired Field and belonging Plot. The *Related Valves* grid is located at the bottom of the page – Figure 48 - Related Valves

Related Valves		
Name	Type	Actions
Test Serbia 2	Standard	<input type="button" value="Edit"/> <input type="button" value="Delete"/>
Test Serbia valve	Standard	<input type="button" value="Edit"/> <input type="button" value="Delete"/>

Figure 48 - Related Valves

To view the valve readings the User needs to click on its name. The Valve readings are listed as graph as well as table. The User can choose the date interval to display or to export as CSV file - Figure 49.

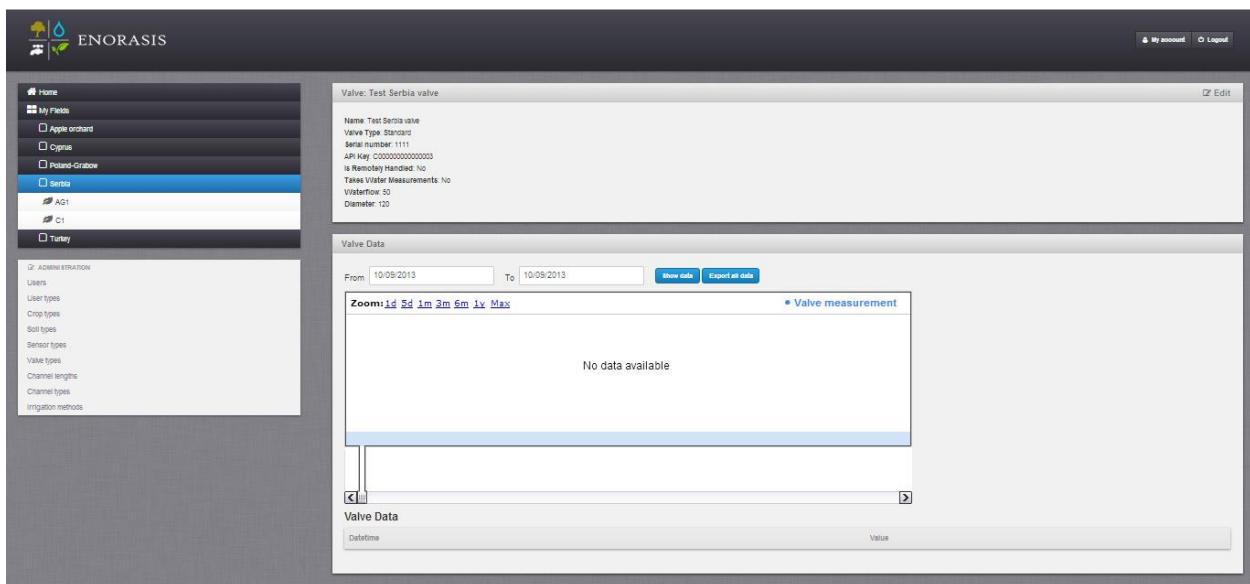


Figure 49 - Valve view

1.15 Insert/Update Sensors

The User firstly needs to select a desired Field and belonging Plot. The *Related Sensors* grid is located at the bottom of the page - Figure 50.

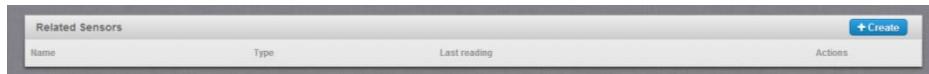


Figure 50 – Related Sensors

After clicking on the *Create* button the *Create Sensor* form will be open as it shown in Figure 51.

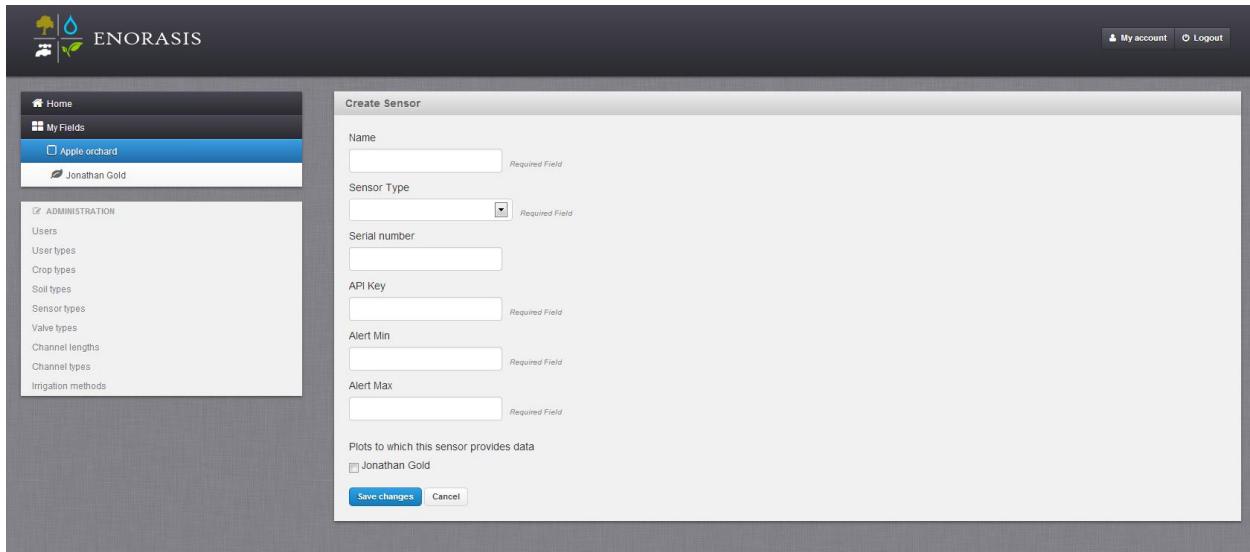


Figure 51 – Create Sensor

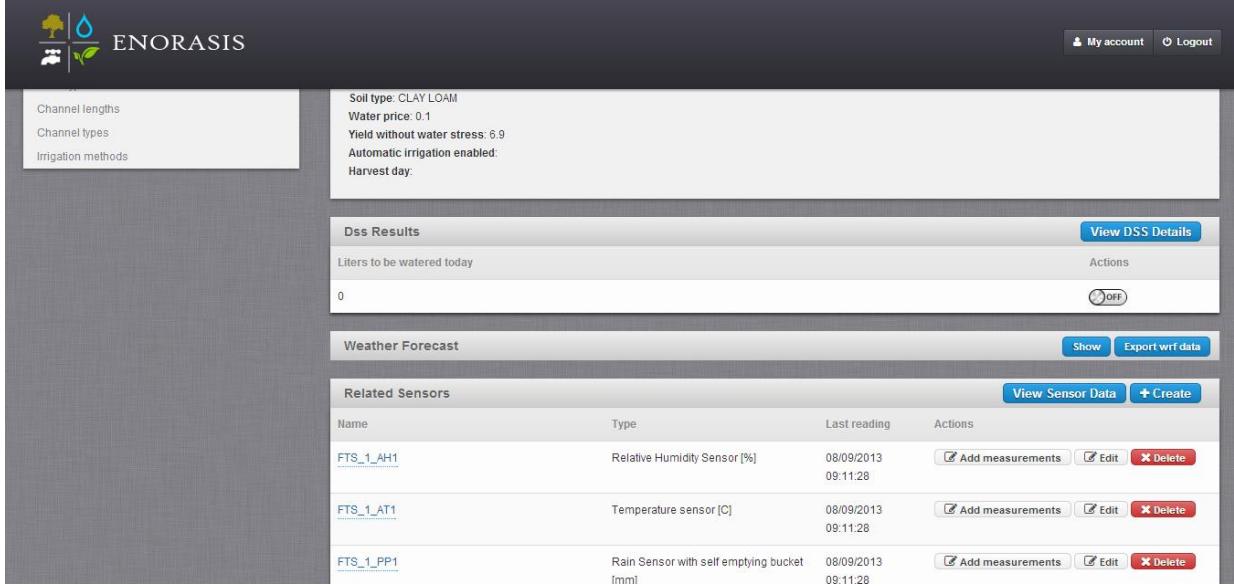
After filling in all the fields and saving the changes the new sensor will be listed in the *Related Sensors* grid - Figure 52.



Figure 52 – Updated Related Sensors

1.16 Sensor view

The User firstly needs to select a desired Field and belonging Plot. The *Related Sensors* grid is located at the bottom of the page – Figure 53



Related Sensors			
Name	Type	Last reading	Actions
FTS_1_AH1	Relative Humidity Sensor [%]	08/09/2013 09:11:28	<input type="checkbox"/> Add measurements <input type="checkbox"/> Edit <input type="button" value="Delete"/>
FTS_1_AT1	Temperature sensor [C]	08/09/2013 09:11:28	<input type="checkbox"/> Add measurements <input type="checkbox"/> Edit <input type="button" value="Delete"/>
FTS_1_PP1	Rain Sensor with self emptying bucket [mm]	08/09/2013 09:11:28	<input type="checkbox"/> Add measurements <input type="checkbox"/> Edit <input type="button" value="Delete"/>

Figure 53 – Related Sensors

To view the sensor readings the User needs to click on its name. The Sensor readings are listed as graph as well as table. The User can choose the date interval to display or to export as CSV file - Figure 54 – Sensor data

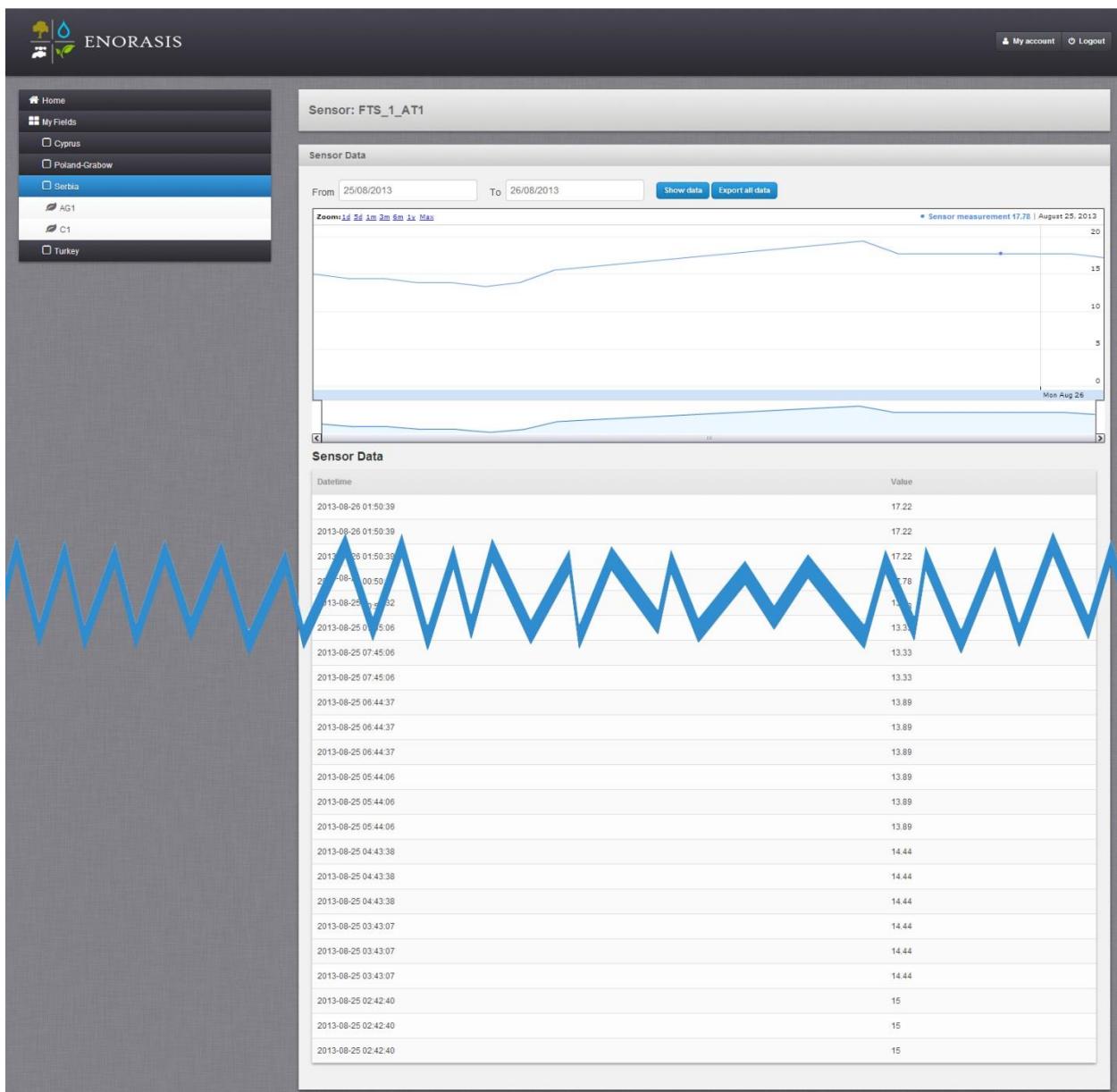


Figure 54 – Sensor data

1.17 Manually insert data for sensor

If for some reason the sensor readings cannot be sent automatically, the User can do that manually. The User firstly needs to select a desired Field and belonging Plot. The *Related Sensor* grid is located at the bottom of the page – Figure 55. In order to insert the data manually the User needs to click on the *Add measurements* button.

The User can enter the sensor readings manually on hourly base for that day as it is shown in Figure 56.

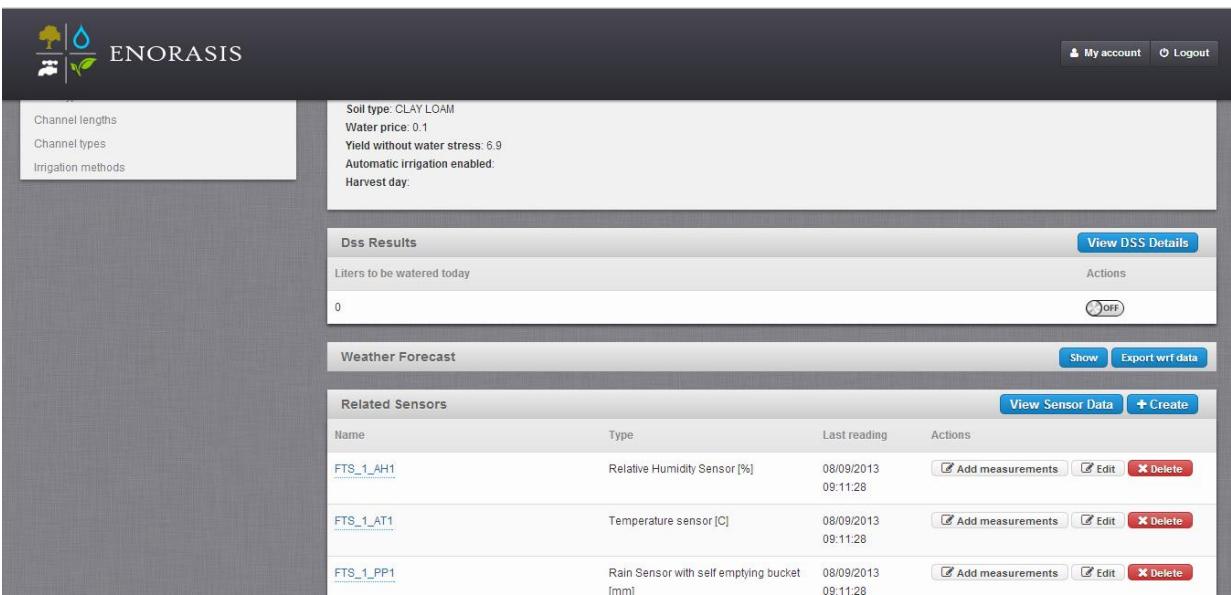


Figure 55 – Related Sensors

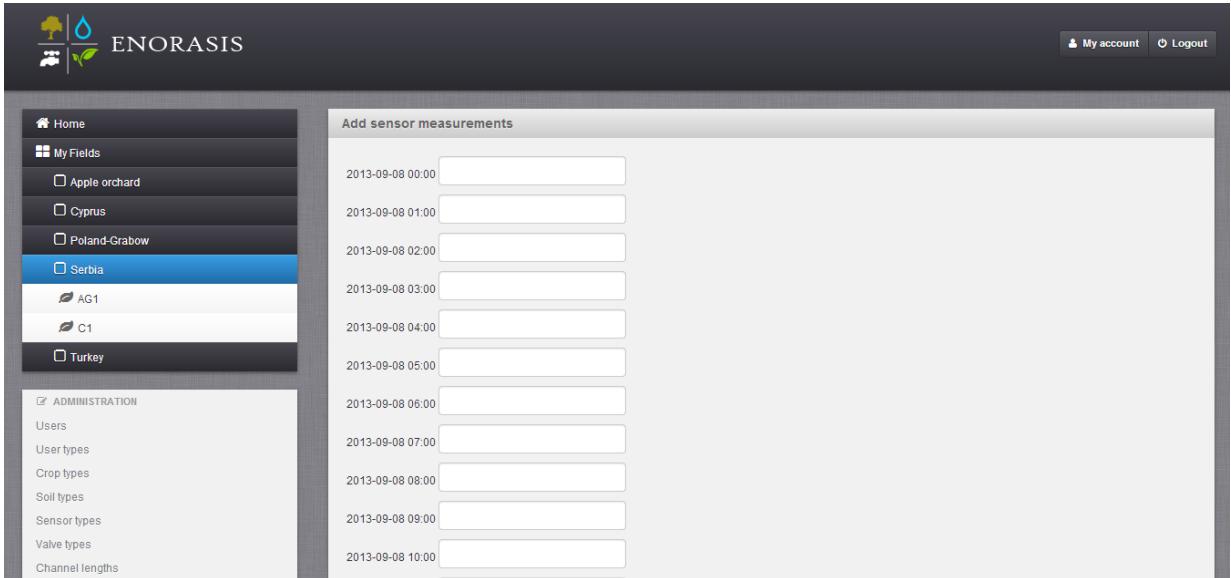
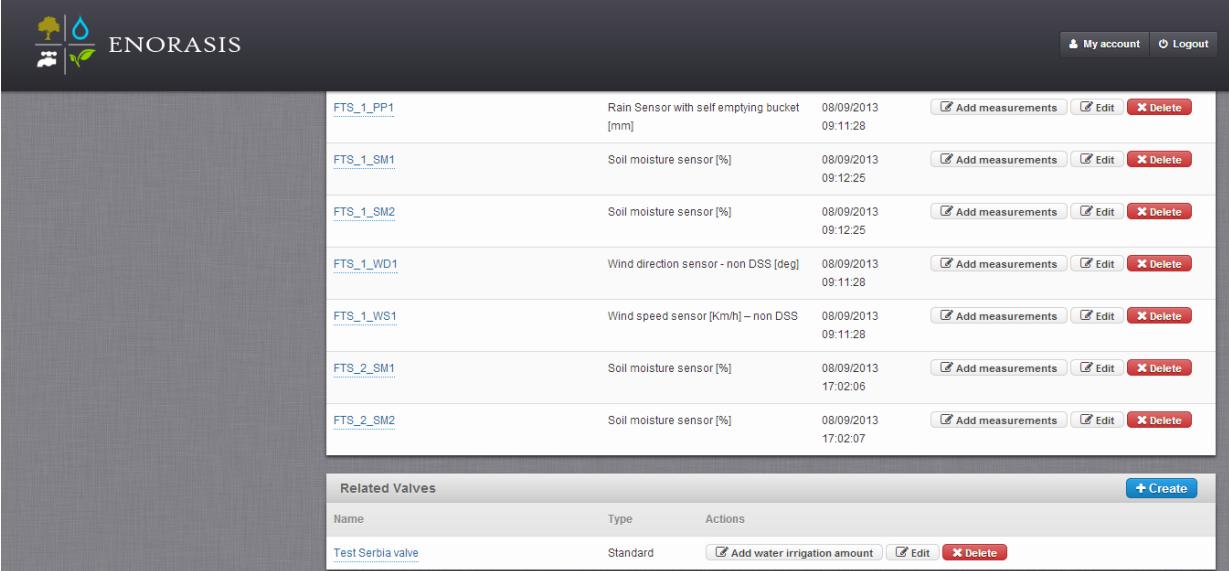


Figure 56 – Add sensor measurements

1.18 Manually insert data for valve

If the User has irrigated manually, he needs to fill the data for the water irrigation amount. The User firstly needs to select a desired Field and belonging Plot. The *Related Valves* grid is located at the bottom of the page – Figure 57. In order to insert the data manually the User needs to click on the *Add water irrigation amount* button.

The User needs to enter the data on hourly base for that day as it is shown in Figure 58.



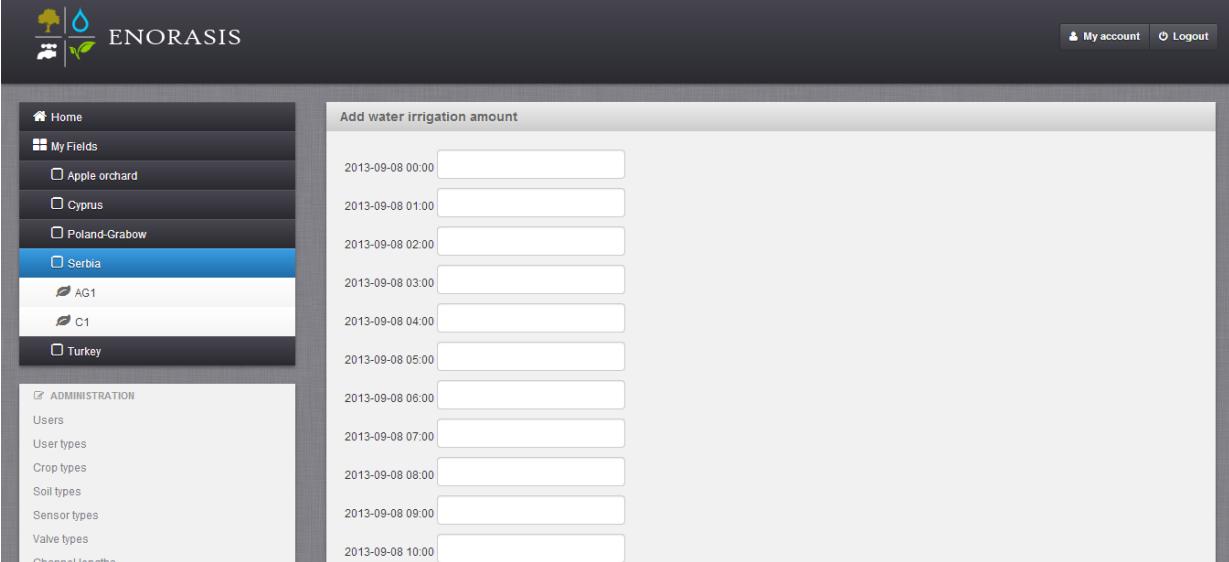
The screenshot shows a list of sensors on the left and a table of related valves on the right. The sensors listed are:

Name	Type	Date	Actions
FTS_1_PP1	Rain Sensor with self emptying bucket [mm]	08/09/2013 09:11:28	<input type="checkbox"/> Add measurements <input type="checkbox"/> Edit <input type="button" value="Delete"/>
FTS_1_SM1	Soil moisture sensor [%]	08/09/2013 09:12:25	<input type="checkbox"/> Add measurements <input type="checkbox"/> Edit <input type="button" value="Delete"/>
FTS_1_SM2	Soil moisture sensor [%]	08/09/2013 09:12:25	<input type="checkbox"/> Add measurements <input type="checkbox"/> Edit <input type="button" value="Delete"/>
FTS_1_WD1	Wind direction sensor - non DSS [deg]	08/09/2013 09:11:28	<input type="checkbox"/> Add measurements <input type="checkbox"/> Edit <input type="button" value="Delete"/>
FTS_1_WS1	Wind speed sensor [Km/h] – non DSS	08/09/2013 09:11:28	<input type="checkbox"/> Add measurements <input type="checkbox"/> Edit <input type="button" value="Delete"/>
FTS_2_SM1	Soil moisture sensor [%]	08/09/2013 17:02:06	<input type="checkbox"/> Add measurements <input type="checkbox"/> Edit <input type="button" value="Delete"/>
FTS_2_SM2	Soil moisture sensor [%]	08/09/2013 17:02:07	<input type="checkbox"/> Add measurements <input type="checkbox"/> Edit <input type="button" value="Delete"/>

The 'Related Valves' table shows:

Name	Type	Date	Actions
Test Serbia valve	Standard		<input type="checkbox"/> Add water irrigation amount <input type="checkbox"/> Edit <input type="button" value="Delete"/>

Figure 57 – Related Valves



The screenshot shows a sidebar with navigation links and a main form titled 'Add water irrigation amount'. The sidebar includes links for Home, My Fields (Apple orchard, Cyprus, Poland-Grabow, Serbia, AG1, C1, Turkey), Administration (Users, User types, Crop types, Soil types, Sensor types, Valve types, Channel lengths), and a search bar. The main form has a list of time intervals from 2013-09-08 00:00 to 2013-09-08 10:00, each with an empty input field for irrigation amount.

Figure 58 – Add water irrigation amount

1.19 Assign rights to Users

The User firstly needs to select a desired Field. The *Field Permissions* grid is located at the bottom of the page - Figure 59. On the *Field permissions* form the User needs to fill in the email of the person that he/she wants to give an access to the selected field. One of the predefined permission options needs to be selected from the drop down menu and finally the *Assign* button needs to be clicked.



The screenshot shows a 'Field Permissions' grid. At the top, a user 'minic@uns.ac.rs' is selected with a 'READ-WRITE' permission level, and an 'Assign' button is visible. The grid table has columns: Name, Email, Role, Approved, and Actions. One row is shown:

Name	Email	Role	Approved	Actions
Vladan Minic	minic@uns.ac.rs	OWNER	No	<input type="button" value="Delete"/>

Figure 59 - Field Permissions

Granted User, its email and role will appear in the *Field Permissions* grid - Figure 60.

Field Permissions

Name	Email	Role	Approved	Actions
Vladan Minic	minic@uns.ac.rs	OWNER	No	<input type="button" value="Delete"/>
Vladan Minic	minic@uns.ac.rs	READ-WRITE	Yes	<input type="button" value="Delete"/>

Figure 60 – Updated Field Permissions